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Research Article

Prevalence and Associated Factors of Gastrointestinal Nematodes in Small Ruminants in Fedis District, Eastern Hararghe Zone, Ethiopia

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Abstract

Background: Gastro-intestinal nematodiosis is one of the major problems which is responsible for serious economic losses due to production losses, morbidity and mortality of small ruminants.

Objectives: Across-sectional study was conducted to determine the prevalence and associated factors of gastrointestinal nematode parasites in small ruminants.

Methods: A total of 219 small ruminants were sampled and examined for qualitative investigation using simple fecal floatation techniques.

Results: Out of 219 examined animals, 61.6% were infected with at least one nematode parasites. This finding showed Strongyle type nematode was recorded in 101(78.4%) which is the most prevalent in both species. Among considered risk factors, the prevalence of gastrointestinal nematodes was statistically significant association ($P<0.05$) with respect to species, sex and body conditions of animals.

Conclusion: This finding showed the higher prevalence of gastrointestinal nematode was observed in small ruminants. Thus practicing of strategic mass de-worming of small ruminants should be implemented in order to control and prevention of nematodiasis.

Keywords: Nematode; Prevalence; Risk Factors; Small Ruminants

Introduction

Infections with gastrointestinal tract (GIT) nematodes are a significant impediment to livestock production in the tropics and elsewhere. It significantly reduces smallholder farmers' incomes through mortality, morbidity, and financial loss associated with treatment [2]. Nematode parasites have varying degrees of pathogenicity. The most economically significant endoparasitic diseases are GIT and respiratory nematodiosis. Degree of nematode infection depends on the age of host, the breed, parasite species involved, and epidemiological patterns which include husbandry practices and physiological status of the animals [3].

Gastrointestinal tract infection has a greater impact in Sub-Saharan Africa due to the availability of a diverse range of agro-ecological factors suitable for diverse hosts and parasite species, adequate nutrition of the host animal and inadequate sanitation in rural areas [1,4]. A wide range of either single or mixed nematode parasite infections is dominantly found in the abomasum, or small intestine, causing GIT nematodiasis. These include *Haemonchus*, *Cooperia*, *Ostertagia*, *Bunostomum*, *Trichostrongylus*, *Oesophagostomum*, and *Nematodirus*. The host–parasite relationship and the prevailing agro-climatic conditions of the country play a vital role in the epidemiology of these nematodes [7].

In Ethiopia strongly suggests that GIT nematode helminthosis is considered as one of the major obstacles to livestock production and productivity. Small ruminants' GIT nematode parasites have

been reported from different parts of Ethiopia, with the prevalence of 50.8% in Western Hararghe Zone [21], 56.8% in Humbo District of Wolaita Zone[6] 88.8% in and around Haramaya University [9] and 47.7% in North Gondar Zone [20].

Despite many studies conducted in Ethiopia, there is also scanty of information on the prevalence and associated risk factors of GIT nematodes from different parts of the country, where large numbers of livestock populations are living. In such areas where small ruminants play a vital role in the community's livelihood, the epidemiology of economically significant diseases such as nematodiasis is very important for control and prevention measures. Therefore the objectives of the this study was to determine the prevalence and associated factors of GIT nematodes of small ruminants in Fedis District.

Materials and Methods

Study area

This study was conducted in Fedis District, Eastern Hararghe Zone of Oromia Region, Ethiopia. It is located 549km east of Addis Ababa and 24km south of Harar at a geographical coordinate of 8° 49′ 43.3″N latitude and 42° 0′ 45.57″E longitude and an elevation of 1285m above sea level. It is neighboring to the East, South, West and North by Babile, Midega Tola, Gurawa and Harari region respectively. The district consists of 19 rural kebeles (the smallest administrative unit) and 2 urban kebeles. The livelihood of population is 93.8% agro-pastoralist while the rest, 6.2% are urban dwellers.

Study design

A cross-sectional study was carried out from March to October 2021 to determine the prevalence and associated factors of GIT nematodes of small ruminants using faecal examination. The prevalence was determined with the factors such as age, sex, species, body condition and origin of the animals. Age groups were determined based on farmers' response and estimated by looking at erupted permanent incisor. Accordingly, age groups were categorized as young, adults and old. Body condition scoring was also categorized as good, medium and poor.

Sample size determination

The sample size was determined by taking 95% confidence interval with the 88.8% expected prevalence of previous study conducted in and around Haramaya University [9] and using the below formula [23].

$N = [(1.96)2\ Pexp\ (1\text{-}Pexp)]/d2;$

Where, N = required sample size, Pexp = expected prevalence, d = desired absolute precision (0.05). Accordingly, 153 samples were needed, but to increase the precision, 219 (94 Ovine and 125 Caprine) were sampled and examined by faecal floatation techniques.

Sampling method

Multi-stage random sampling was used to select the study animals. The three kebeles were randomly selected namely B/Arba, Iftu and Boko. Equal proportion of animals i.e., 73 from each kebeles were sampled. Finally, systematic random sampling method was employed to select the individual animals by taking every animal chosen based on the calculated interval between first and second up to nth term from the selected herd.

Sample collection and examination

During sample collection, the information like address, sex, age, species, history of deworming and body condition scores were recorded and labelled on the bottles used for sample collection. Faecal sample was collected directly from the rectum of 219 small ruminant in screw cupped bottles using disposable plastic gloves and preserved with in ice box and transported to Fedis district Boko Veterinary Clinic and stored at $+4^0$C until laboratory examination was done. The fecal samples were processed and examined by faecal floatation technique for qualitative investigation of the types of nematode eggs by 10X light microscope following the standard procedure [10].

Data analysis

All of the data obtained from the field and laboratory tests were entered in to MS Excel spread sheet and analyzed by SPSS version 22.0. The significant association between the prevalence of GIT nematode and associated factors was determined by Chi-square test (x^2). The difference was regarded as statistically significant if P value was less than 0.05 at 95% confidence interval.

Results

The result of the present study showed that 61.6%of an overall prevalence of GIT nematodes in small ruminants was positive for at least one nematode species. This finding indicates, the rate of infection was higher in sheep (70.2%) than in goats (54.8%). In this study, species, address, sex, age and body condition of animals was assessed as risk factors for occurrence of GIT nematode. It was observed that significant association ($P < 0.05$) with respect to spe-

cies, sex and body conditions. While there was no significant difference (P > 0.05) between age groups and origin of animals (Table 1).

Of 135 infected small ruminants, 101(74.8%) 26(19.3%), 5(3.7%) and 3(2.2%) were positive for *Strongyle*, *Strongyloide*, *Trichuris* and *Ascaris* respectively. The proportion of *Strongyle* was higher in goats (79.9%) than in sheep (69.7%), but the prevalence of *Strongloides*, *Trichuris* and *Ascaris* species were higher in sheep than in goats. The coprological examination revealed that the prevalence of *Strongyle* types genera were higher than other GIT nematode parasites of small ruminants (Table 2).

		Genera of GIT nematodes and their prevalence (%)			
Species	**No of Positive**	**Strongyle**	**Strongyloide**	**Trichuris**	**Ascaris**
Sheep	66	46 (69.7%)	15 (22.7%)	3 (4.5%)	2 (3.1%)
Goat	69	55 (79.9%)	11 (15.9%)	2 (2.9%)	1 (1.4%)
Total	135	101 (74.8%)	26 (19.3%)	5 (3.7%)	3 (2.2%)

Table 1: Prevalence and types of GIT nematodes of small ruminants.

Risk Factors	Variable	No of Examined	No of Positive (%)	x^2	P Value
Address	B/Arba	73	49 (67.1%)	4.356	0.061
	Iftu	73	48 (65.8%)		
	Boko	73	38 (52.1%)		
Species	Ovine	94	66 (70.2%)	5.046	<0.05
	Caprine	125	69 (55.2%)		
Sex	Male	109	56 (51.4%)	9.347	0.048*
	Female	110	79 (71.8%)		
Age	Young	52	24 (46.2%)	14.003	0.001**
	Adult	106	62 (58.5%)		
	Old	61	49 (80.3%)		
Body Conditions	Good	41	49 (67.1%)	19.371	<0.001**
	Medium	110	48 (65.8%)		
	Poor	68	38 (52.1%)		

Table 2: Prevalence and associated factors of GIT nematodes of small ruminants.

Discussion

The current study showed that the prevalence of GIT nematode were 70.2% in sheep and 55.2% in goats with an overall prevalence of 61.6% of small ruminant were infected with at least one nematode parasites. This finding agrees with the previous findings in Ethiopia [11,18] who reported 61% and 64.1% respectively. The present finding was higher than the previous findings in Ethiopia [13,14] who reported 43.2% and 44.90% respectively. However the current finding is lower when compared to the findings in Ethiopia [9,16,18] who reported 87.5%, 71.88% and 88.8% respectively. This difference could be due to the extensive use of anthelminthic by farmers, different in agro climatic conditions and management system of the pastures [14].

In this study, the proportion of *Strongyle* type was higher than other GIT nematodes in both species. This finding supports the works of [12, 21,25] who reported higher prevalence of *Strongyle* infection than other GIT nematodes. This might be due to the fact that small ruminants have different level of resistance for different species of parasitic infections and *Strongyle* type may be related with the direct life cycle nature of this parasite [25].

In agreement with this finding in Ethiopia reported by [21,24] and in Kenya by Waruiru [5] reported the infection rate was higher in sheep (70.2%) than in goats (55.2%) and the difference was statistically significant (P < 0.05). This might be due to the fact that sheep have frequent exposure to communal grazing lands that have been contaminated by faeces of infected animals.

The present study finding observed that insignificant association (P > 0.05) between address of animals. This finding supports other works in Ethiopia [18,20] who found insignificant difference between origin of animals. This might be due to all of the animals in the study area have equal chance to acquire the infections because of the same agro-climatic condition and husbandry practices [9].

Statistically significant association (P < 0.05) between sexes was observed with higher prevalence of GIT nematodes in female (71.8%) than in male (46.2%). This finding is similar with other findings in Ethiopia which reported as significant variation (P < 0.05) between sexes [6,19]. This might be due to females are more susceptible than males to parasitism during pregnancy and perparturient period due to stress and decreased immune status. This

finding is contraindict with the reports in Ethiopia [17,23] who found insignificant (P > 0.05). This might be due to the fact that GIT nematodes affecting both sex equally due to having similar ecology and management system.

The present study showed that the highest prevalence of GIT nematodes (72.1%) was observed in animals with old age groups than adult and young, but the association was no statistically significant (P > 0.05). This finding is in agreement with finding from Kenya [5] and from Ethiopia [18] who reported insignificant difference (P > 0.05) between age groups. This might be due to all age groups have equal chance of exposure as all can graze under extensive management system.

With regards to body conditions, the prevalence of GIT nematodes was statistically significant variation (P < 0.05) with the highest infection rate of 79.4% was observed in poor body conditioned animals followed by medium and good with the prevalence of 60% and 36.6% respectively. The current finding is agreed with other findings in Ethiopia [9,20,26] who reported that animals with good body conditions were less affected than medium and poor due to a better immunity. This might be due to animals with good body condition have better immunity compared to others [20,26].

Conclusion and Recommendations

The GIT nematodes parasites of small ruminants are one of the most important parasitic diseases that can result in reducing the production and productivity of small ruminants. As a result, the high prevalence of GIT nematode infection reported from the study area are responsible for economic losses due to reduced production, morbidity and mortality. Based on types of GIT nematodes species, which are dominated by *Strongyle* type shows the significant effects in the studied area. Among considered risk factors, the current finding indicates that the prevalence of nematodiasis was significantly associated (P < 0.05) with respect to sex, species and body conditions of animals. Therefore based on the above conclusions the following recommendations were forwarded.

- Community awareness creation should be practiced to reduce the economic impact of helminth parasites on animals.
- Further researches should be carried out on epidemiology of helminthosis in all species of animals in the Study area.
- Strategic mass deworming of both species with broad spectrum anthelminthic should be practiced in order to reduce and effectively to treat the infection completely.

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Conflicts of Interests

The Author have not declared any conflict of interest.

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