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Prevalence of Gastrointestinal Nematodes of Small Ruminant in Fedis District of East Hararghe Zone, Ethiopia

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Abstract: A cross-sectional study was conducted from September 2015 to January 2016 to determine the prevalence of gastrointestinal nematodes (GIT) parasites, to identify the species involved and to assess associated risk factors of GIT parasites of small ruminants in Fedis District. In this study, postmortem examination was conducted to appreciate the adult parasites by collecting intestinal contents from slaughtered sheep and goats in different restaurants found in Fedis District. From a total of 384 animals (208 sheep and 100 goats) examined, overall of 292 (76.0%) individual animals were harboring one or more GIT parasites. The study comprised Peasant Associations (PAs), species, sex, age and body condition of animals as a major risk factors those plays a role for the existence of GIT parasites in the study area. A prevalence of 73.23% was recorded in sheep and 84% in goat in which the analysis showed statistically significant difference between the species of animals ($P<0.05$, OR=1.99, CI=1.1-3.6). The prevalence of GIT parasites in sex of animals was recorded as 71.97% in female, 79.70% in male. This showed that, there was statistically significant difference between the two sexes in prevalence of GIT parasites ($P<0.05$, OR= 1.6, CI= 1.1-2.7). Age wise analysis of prevalence was indicated that the absence of difference in prevalence rates between the age groups was recorded (76%) in both young and adult age groups with no statistically significant variation ($P>0.05$). Comparison was also made on the rate of parasites in the study area in which the majority of them (41%) were animals with poor body conditions, but prevalence of GIT parasites (72.7%, 77.2% and 78.9%) were recorded in poor, medium and good body conditioned animals, respectively. The prevalence of GIT parasites was 73.2% and 28.8% in both *ovine* and *caprine* species, respectively. Also different prevalence rates of 26%, 30.8%, 22.6% and 20.5% were observed with *Haemonchus, Trichostrongylus, Stronglus* and *Nematodirus* species, respectively. GIT parasites of the small ruminants in the study area has been found to be very important problem and further laboratory examination is recommended to identify species of parasite in order to design appropriate control measures.

Key words: Fedis · GIT · Parasite · Prevalence · Sheep · Goat

INTRODUCTION

The livestock sector accounts for about 30% of the agricultural GDP in Sub-Saharan Africa and nearly 60% of the value of edible livestock products is generated by cattle. Over 90% of Africans small ruminants are found in east and West Africa. Small ruminants are mainly found in arid and semi-arid areas of sub-Saharan Africa. Compared to cattle and camels, sheep and goats contribute a larger proportion of readily available meat in the diets of pastoralists [1].

They have been estimated to provide up to 30% of the meat and 15% of the milk supplies in sub-Saharan Africa where thrive in a wide range of ecological regions often in conditions too harsh for the beneficial rearing of cattle. Small ruminants have also been reported to survive

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better under drought conditions than cattle due to their low body mass and low metabolic requirements which in turn minimize their water requirements and maintenance needed in arid and semi-arid areas [2].

Sheep and goats are mainly found in arid and semi- arid areas of sub-Saharan Africa. They play a vital role in rural economies through the provision of meat, milk, household income, manure and skin. Compared to cattle and camels, sheep and goats contribute a larger proportion of readily available meat in the diets of pastoralists. They have been estimated to provide up to 30% of the meat and 15% of the milk supplies in sub-Saharan Africa where thrive in a wide range of ecological regions often in conditions too harsh for the beneficial rearing of cattle. Small ruminants have also been reported to survive better under drought conditions than cattle due to their low body mass and low metabolic requirements which in turn minimize their water requirements and maintenance needed in arid and semi-arid areas [2].

The estimated 25.01 million of sheep and 21.9 million of goats in Ethiopia [3] provide an important contribution to the national economy [4]. Although small ruminants represent a great resource for the nation, the productivity per animal is low due to different types of diseases, poor management and lesser efforts provided to improve the performance of the animals are to be responsible for the reduced productivity [5]. From these different types of diseases stomach and intestinal worms are the most common one which occur in all species of animals. Young and malnourished animals of both sexes and lactating animals are most susceptible to these parasites. gastrointestinal nematode affect specially camels, goats and sheep. Different types of worms are transmitted when an animal eats grass or drinks water contaminated with larva or eggs. The problem is especially common in the rainy season [6].

Even though Ethiopia endowed with large number of sheep and goats populations, little attempts has been made in the past to study the health aspect of these animals particularly in the current study area. Lack of well-established data on the magnitude, distribution and predisposing factors of small ruminant nematode helminthes in the study area initiated this study. Therefore, the objective of this study were to determine the prevalence of nematode helminthes and the possible risk factors that contributes for the occurrence of nematode helminthes of small ruminants in the study area.

MATERIALS AND METHODS

Description of Study Area: The study was conducted from July 2015 to September 2015 in Fedis district, Oromia region, Eastern Harerghe Zone. Fedis district is located to 8°22 and 9°14 N latitude and 42°62 and 42°19 ‘E longitude. The district is 549 Km East of the capital city Addis Ababa and it has an average altitude of 1200-2118 m a.s.l in the South East. The district covers an area of 1010 km^2 that is divided in to 19 Peasant Associations (PAs) and 2 urban administrations, with 650-900 mm average annual rain fall and 25-30°C average annual temperature. The main cash crop in the district is chat [3].

Study Population: Small ruminants that present in Fedis district are local origin and kept under traditional according to [7], Age group of the animals (Above one year and less than one year) were grouped as adult and young extensive management system and included in this study. Small ruminants in Fedis district are local breeds and kept under traditional extensive management system. Age group of the animals was grouped as adult and young according to [7], above one year and less than one year respectively in the study.

Sampling Method and Sample Size Determination: Simple random sampling method was followed to collect fecal samples from the individual animal. The sample size was determined based on the formula described by [8] with 95% confidence interval at 5% desired absolute precision and by assuming the expected prevalence of 50%.

$$n = \frac{1.96^2 (p_{exp})\,(1 - p_{exp})}{d^2}$$

where, n = sample size P= expected prevalence D = desired level of precision. Therefore, the estimated sample size will be 384 samples.

Study Design: A cross sectional type of study method should be was followed in this study. Fecal sample should be collected directly from the rectum of individual selected animals with strict sanitation and placed in air and water tight vials and then taken to Fedis district laboratory for further coprological examination. In the laboratory the samples were subjected to modified floatation technique to identify the presence or absence of nematode eggs by following the standard procedures. Types of the egg will be differentiated based on their morphology.

Data Analysis: All the data entry and management was made using Microsoft Excel sheets. Data analysis was made using Statistical Package for Social Science (SPSS) version 20. Descriptive statistics was used to determine the prevalence of the parasites and was used to determine any association between the prevalence of GIT parasites with age, sex and species of animals. In all the analyses, confidence level was held at 95% and P<0.05 was set for significance.

RESULTS

From a total of 384 animals (208 sheep and 100 goats) examined, overall of 292 (76.0%) individual animals were harboring one or more GIT parasites. The study comprised PAs, species, sex and age and body condition of animals as a major risk factors those play a role for the existence of GIT parasites in the study area (Table 1). Over all prevalence of gastrointestinal nematode in sheep and goat was 76.0% (292/384). A prevalence of 73.23% (208/284) in sheep, 84% (84/100)in goat,71.97% (131/182) in female, 79.70%(161/202) in male, 76.06%(89) in adult, 76.02% (203) in young, 29.947, 15.885,30.208 prevalence of poor, medium and good body conditions, respectively were observed during data collection.

Prevalence of GIT Parasites Based on Species, Sex and Age of Animals: Prevalence rates of GIT parasites according to the species of animals found to harboring one or more species of parasites were 208 (73.23%) and 84 (84%) sheep and goats, respectively. There was statistically significant difference between of species of animals in prevalence of GIT parasites (P<0.05, OR= 1.99, CI = 1.1-3.6). This result shows *Ovine* species were more likely to be affected by GIT parasites more than two times as compared to that of *Caprine* species. On the other hand, there was no variation in the occurrence of GIT parasites among the animals of different Peasant Associations (PAs) selected for the study. Relatively high record was observed in Iftu (78.68%) as compared with others (Table 1).

Comparison was made on the prevalence of GIT parasite of female and male. Out of animals sampled, the majority or 52.6% were males while about 47.4% of them were females. The prevalence of GIT parasites were 47.4% and 52.6% in female and male respectively (Table 1). There was statistically significant difference between the two sex of animals in prevalence of GIT parasites (P<0.05, OR= 1.6, CI= 1.1-2.7).

Analysis of age wise prevalence of GIT parasite was indicated that the absence of difference in prevalence between the age groups in which equal prevalence of GIT parasites was recorded (76%) in both young and adult age groups with no statistically significant variation (P > 0.05) (Table 1). According to body conditions, comparison was also made on the rate of parasites in the study area. Out of animals examined the majority of them were animals with poor body condition (41%), but 72.7%, 77.2% and 78.9% were recorded in poor, medium and good body conditioned animals, respectively. However, the result indicates that there was no statistical difference among body condition scores.

Table 1: Prevalence of GIT parasite with different risk factors

							95% CI	
Risk Factors		No of examined	No of infected	Prevalence (%)	P-value	OR	Lower	Upper
PAs	Balina arba	137	102	74.45	0.451	1.26	0.691	2.296
	Umar kule	125	94	75.2	0.554	1.2	0.655	2.202
	Iftu	122	96	78.68				
Species	Sheep	284	208	73.23	0.026	1.99	1.088	3.634
	Goat	100	84	84				
Age	Young	267	203	76.0	0.833	0.94	0.554	1.610
	Adult	117	89	76.0				
Sex	Female	182 (47.4%)	131	71.9	0.044	1.6	1.013	2.663
	Male	202 (52.6%)	161	79.7				
Body condition	Poor	158 (41%)	115	72.7	0.029	1.43	0.835	2.455
	Medium	79 (20.6%)	61	77.2	0.851	1.07	0.546	2.084
	Good	147 (38.3%)	116	78.9				
	Total	384	292	76.0				

Note: PAs = Peasant Associations

Table 2: Prevalence of GIT parasite based on different species of parasites and animals

Variables	No of animals examined	No of overall Positives (%)	Species of Parasites (%)			
			Haemonchus	*Trichostrongylus*	*Strongylus*	*Nematodirus*
Animal Species						
Ovine	284	208 (73.2)	54 (26)	61(29.3)	53 (25.5)	40 (19.2)
Caprine	100	84 (28.8)	22(26.2)	29 (34.5)	14 (16.7)	20 (23.8)
Age						
Adult	117	89 (76.1)	22(24.7)	31(34.8)	19 (21.3)	16 (18)
Young	267	203(76)	54(26.6)	59 (29.1)	47 (23.1)	44 (21.7)
Sex						
Male	202	161(79.7)	43(26.7)	55(34.2)	41(25.5)	22 (13.7)
Female	182	131(71.9)	33(25.2)	35(26.7)	25(19.1)	38 (29)
Body condition						
Poor	158	115 (72.8)	33(28.7)	28(24.3)	33(28.7)	21(18.3)
Medium	79	61(77.2)	18(29.5)	17(27.9)	9(14.8)	15(24.6)
Good	147	116(78.9)	25(21.6)	45(38.8)	24(20.7)	24(20.7)
Total	384	292 (76)	76 (26)	90 (30.8)	66 (22.6)	60 (20.5)

Prevalence of Gastrointestinal Parasites Identified: Of the total 384 sheep and goats examined during this study, 292 (76.0%) were found infected with different species of gastro-intestinal parasites. Prevalence rates of 54 (73.2 %) and 22 (28.8%), were recorded in *ovine* and *caprine* species, respectively. Also different prevalence rates of 26%, 30.8%, 22.6% and 20.5% were observed with *Haemonchus, Trichostrongylus, Stronglus* and *Nematodirus* species, respectively (Table 2). An individual animal was harbored with more than one species of parasites.

DISCUSSION

Current study reveals that the prevalence of GI nematode both in sheep and goat is slightly higher in goats which varied from other reports [9, 10]. The reason that goats are kept on semi-intensive grazing system [9] and prefer to browse shrubs [10] which might reduce the infection rate was not found in the present study. This variation might be associated to the practice of grazing sheep and goat together in the same area so that goats may acquire more susceptibility for the same species of parasite infection. Immunological response of goats for nematode infection is limited compared to sheep [11].

The finding of our work is in a harmony to different researchers [12-14] who have found a direct influence of grazing characteristics on the prevalence of most of gastrointestinal helminths. This observation, however, agrees with reports from western Oromia [12] and eastern Ethiopia [15], which showed higher prevalence in goats than in sheep. These authors ascribed their observation to the fact that most of the goats in their study were from lowland and mid altitude areas, which are thought to be suitable for survival of the larval stage of the parasites. Furthermore, it is statically significant (x =3.965 and $p<0.05$). This could be assumed that sheep do have a considerably higher related to their higher susceptibility to infection than immunological response to gastrointestinal parasites other groups. This agrees with [13, 16].

Our result was lower than report of [17] with prevalence of 43.5% and 55% in sheep and goats, respectively and [18] who reported prevalence of 54.76% in sheep of Asella. The differences of the prevalence may be due to management and the current study area was ever green that animals are grazing elsewhere rather than around water source which is most favourable for development and survival of free-living stages of the parasites.

In present study reveal that the prevalence and intensity of infection was high in males (79.70 %) as compared with females (71.97 %). The present results are supported by [19] that males were more susceptible to parasitic infections than females. Effect of sex on the resistance level against GI parasites was reviewed by Barger [20] and reported that difference in resistance level were significant after puberty only. The difference in resistance level after puberty is due to estrogen stimulatory effect on immune response against GIT nematodes while androgen suppresses the immune response [21] and this is the reason that males are more susceptible to infectious diseases including nematode parasites than female.

Heavy infection rate and intensity was found in house hold animals (45.33 %) than grazing animals (36 %). These results are in agreement to that of [22] that grazing animals have low prevalence rate as compared to house hold animals. Limited information is available to compare the prevalence and intensity of nematode infection in house hold and commercially raised goats. High infection in house hold goats may be attributed to confinement in a limited contaminated environment that results in continuous infection while lower infection commercially raised goats was due its browsing.

The gastrointestinal nematodes of Shoat are one of the important parasitic diseases that obviously result in reduced productivity of sheep raised by smallholders using traditional husbandry management system in Fedis district. The coprological examination done for this study using direct faecal floatation method revealed an overall gastro-intestinal infection prevalence of 76.0% shoat originating from this area which were being parasitized at least by one type of gastrointestinal nematodes. However, apparent differences were also noted, this finding agrees with previous studies by coprological examination in some areas of Ethiopia 76.3% [23] and 79.09% [24].

In the current study the prevalence of *Trichostrongylus spp* during the qualitative fecal, examination *was* 31.5% in shoat. This result was in agreement with Hailelul [25]. The prevalence of *Haemonchus* spp. was 25% in shoat. [26] who reported that recorded the genera of nematodes *Haemonchus* and *Trichostrongylus* as 33% and 29%, respectively. Our result was lower than findings of [25]. Other authors have similarly reported these genera in the country, *Hemonchus* sp. being the most prevalent [15] and elsewhere [27, 28]; however, it is contrary to the reports of other authors [9, 29, 30] who documented a higher prevalence of *Trichostrongylus* sp. Although the phenomenon of resistance of *Trichostrongylus* sp. to adverse environmental condition relative to *Hemonchus* sp. [9, 31] does not exist in, the prevalence nematodirus (20.54%) this study agree with [32] who reported that *Nematodirus* (29.03%).

The study further revealed that age of the animal did reported a prevalence of 1.1% in sheep and goats of not show significant association with the prevalence of three different agro ecological zones of southern the parasites. This difference might be due to the difference groups is contrary with previous reports [33, 34] between the management system of examined animals Ethiopia and elsewhere [13, 35]. Age was and geographical and environmental location of the considered an important risk factor in GI nematodes area. Several authors have documented that adult and old In the present study, a higher prevalence of major animals develop acquired immunity [11, 33, 36, 37] against GI nematode parasites was observed in goats than in nematode infections as they get mature due to repeated sheep which is in agreement with the other reports exposure and this will help expel the parasite before it [18, 33] in western and eastern parts of Ethiopia and establish itself in the gastrointestinal tract.

Age wise observation revealed no statistically significant difference in infestation of parasites between ages This finding agrees with reports from Gambia and Semi-arid part of Kenya that indicated that GIT helminthes affect both ages equally [35, 38]. The present finding disagrees with most literatures, [12, 39, 40] that young animals (sheep and goats) are more susceptible to parasite infection than sheep and goats older than 1 year of age The researchers justified the result that it could be because adult animals may acquire immunity to the parasite through frequent challenge and expel the ingested parasite before they establish infection [41]. This finding also contradicts with report of [42] who stated that young animals are susceptible due to immunological immaturity and immunological unresponsiveness. However, in this study we ascribe the absence of significant difference in parasites infestation between ages of animals to the small number of young animals used and the imprecise determination of age of the animals.

Of the total 384 shoat examined, 158, 78 and 147 were categorized as having poor, medium and good body condition scores. Infection prevalence was insignificantly higher in animal with good body condition when compared to that of medium and poor body condition scores ($P > 0.05$). The overall infection prevalence according to body condition grades, 78.9, 77.2 and 72.7% with good, medium and poor, respectively. In recent study an insignificance difference was observed in GIN infection in relation to body condition where higher prevalence of GIT was recorded in good body condition, this disagree with [13]. This poor body condition might be due to mal nutrition other concurrent disease or the current parasitic infection which lead to poor immunological response to infective stage of the parasites.

CONCLUSION AND RECOMMENDATION

Gastrointestinal parasites of the small ruminants in the study area has been found to be very important problem due to not only to its high prevalence, but also to

its pathogenic role as well as loss of production, reducing growth rate and death of small ruminants it causes. Fedis district is conductive for the successive perpetuation of Nematode parasites and favourable for subsequent transmission to susceptible hosts. Based on the above conclusion, the following recommendations were forwarded:

- Awareness creation to the farmers in the study area on the effect of GIT parasite and its control.
- Strategic deworming of small ruminants using broad spectrum antihelminthics should be practiced.
- Further studies on economic losses and epidemiology of GI parasite of shoats should be conducted on the study area.

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