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Epidemiology of Gastrointestinal Parasites of Small Ruminants in Gechi District, Southwest Ethiopia

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Abstract: A cross-sectional study was conducted from October 2011 to March 2012 on 410 randomly selected small ruminants (255 sheep and 155 goats) in Gechi district, Southwestern Ethiopia, with the objectives of determining the prevalence of gastrointestinal (GI) parasites and assessing the potential risk factors. The overall prevalence of gastrointestinal parasites was 82.2% (337/410). 84.3% (215/255) of sheep and 78.7% (122/155) of goats harbored gastrointestinal (GI) parasites. Nematode parasites, Eimeria and Moniezia were found to infect the small ruminants in the area with the overall prevalence of 54.1%, 14.6% and 13.4%, respectively. There was a statistically significant difference in the prevalence of gastrointestinal parasites between sex ($P < 0.05$; OR=1.904) and species of animals ($P < 0.05$; OR=1.941), but no between the different age groups. Out of the 337 sheep and goats that were positive by floatation technique, 9.2, 65.5 and 25.2% were massively, moderately and lightly infested, respectively. However, there was no statistically significant difference in egg per gram (EPG) among different age groups, sex and species. This study showed that, GI parasites are highly prevalent in small ruminants of Gechi district. Therefore, control via strategic deworming and appropriate grazing techniques of animals should be encouraged in the study area.

Key words: GI Parasite · Epidemiology · Small Ruminants · Gechi · Southwest Ethiopia

INTRODUCTION

It has been estimated that goats and sheep provide up to 30% of the meat and 15% of the milk supplies in sub-Saharan Africa where thrive in the wide range of ecological regions which are 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. The frequent droughts and large tsetse infested areas in sub-Saharan Africa requires more small ruminants in order to supplement cattle production [1].

Ethiopia possessed 25.01 million of sheep and 21.9 million of goats [2] from which 13,491 sheep and 12,397 goats were owned by farmers in Gechi district of the Ilubabor zone [3]. Despite the large number of small ruminant population of Ethiopia, infections caused by GI parasites are major drawbacks hindering small ruminant productivity [4]. Gastrointestinal parasite infections have greater impact in Ethiopia due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species. Economic losses are caused by GI parasites due to losses through lowered fertility, reduced work capacity, involuntary culling, a reduction in food intake and lower weight gains, lower milk, meat and wool production, veterinary costs and loss due to mortality in heavily parasitized animals [5].

In Ethiopia, parasitological investigation of small ruminants in the humid central highland region had demonstrated presence of nematodes of several generas [6]. Despite the large population of sheep and goats and their economic importance, little is known about the prevalence, species diversity and level of infestation of GI parasites in small ruminants in Gechi district of Iluababor zone. Knowledge of the nature and level of GI parasitism in a given agro-ecological zones or even microclimate niche is very important in order to recommend the most cost-effective control measures. Thus, the objectives of

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this study were to determine the prevalence and assess the potential risk factors associated with the prevalence of GI parasites of small ruminants in the study area.

MATERIALS AND METHODS

Study Area and Period: A study was conducted in four randomly selected kebeles (Smallest administrative unit) of Gechi District of Illubabor Zone, South Western Ethiopia from October 2011 to March 2012. It is located 462Km to the west of Addis Ababa, at an altitude of 1500-2100 meters above sea level and Latitude 8° 16' 48.00"N Longitude 36° 34' 12.00"E. The total area of the district is about 48,632 hectares. The climatic condition of the area is sub-humid with the mean annual rain fall of 1825 mm and annual minimum and maximum temperatures of 13 and 18°C, respectively [3].

Study Animals: The study was performed on 410 (255 sheep and 155 goats) small ruminants all of which were local breeds and kept under traditional extensive management system.

Sample Size Determination and Sampling Method: The total sample size was calculated based on the predetermination of the following parameters: a 95% level of confidence, 5% desired level of precision and 50% expected prevalence according to [7]. Accordingly, the minimum required sample size was 384 but in order to increase the precision, a total of 410 animals (255 sheep and 155 goats) were sampled.

Study Design and Study Methodology: A cross-sectional study was the design used in the study. The samples were collected from both sexes and different age groups. Age was determined for both species based on dentition. Conventionally, animals with age less than or equal to 2 years were classified as young and those above two years of age as Adults. In this study, 10 gram of fecal samples were collected directly from the rectum of each study animals using a gloved finger and each collected samples were put in the universal bottle and labeled. Ten percent (10%) formalin was added to preserve parasite eggs, so there will not be significant changes in the egg morphology and counts until it was processed for qualitative and quantitative parasitological examination [8]. The collected samples were subjected to qualitative (Sedimentation and Flotation) and quantitative (McMaster egg counting) parasitological techniques in Bedelle regional laboratory.

The degree of infection was categorized as light, moderate and severe (massive) according to their egg per gram of faeces (EPG) counts. Egg counts from 50-799, 800-1200 and over 1200 eggs per gram of feces were considered as light, moderate and massive infection, respectively [9-11].

Data Analysis: All collected data were entered to Micro-Soft Excel sheet and analyzed by SPSS version 16. Descriptive statistics was used to determine the prevalence of the parasites and Chi-square test ($\chi 2$) was used to assess the association of the potential risk factors with the prevalence of the parasites and logistic regression was also used to assess the strength of association. For statistical analysis, a confidence level of 95% and a P-values less than 5% were considered significant.

RESULTS

The overall prevalence of gastrointestinal parasites in small ruminant was 82.2% (337/410). The prevalence in sheep and goats were 84.3% and 78.7%, respectively (Table 1). In both chi-square test and univariate analysis significant difference was observed ($P<0.05$; OR=1.941) in the prevalence of GI parasites between the two species of animals (Table 1 and 2). A prevalence of 90.2% and 82.9% were observed in females and males, respectively and there was a significant variation ($P<0.05$; OR=1.904) between sex (Table 1 and 2). Adult and young animals were found to be infested with a prevalence of 88.2% and 85.4%, respectively with no statistically significant difference (Table 1).

The predominant GI parasites identified in small ruminants were Nematode, Emeria and Monezia with overall prevalence of 54.1%, 14.6% and 13.4%, respectively (Table 3).

A total of 337 fecal samples that were positive by qualitative parasitological techniques were subjected to EPG count using McMaster egg counting technique. Accordingly, 85 (25.2%), 221 (65.6%) and 31 (9.2%) were found to be lightly, moderately and massively infested respectively. No significant difference was observed in the EPG count across the potential risk factors (Table 4).

Table 1: Prevalence of the GI parasites in relation to species, sex and age as risk factors

Risk factor	Total animal examined	No positive (prevalence)	χ^2	P-value
Species				
Sheep	255	230(90.2%)	5.048	.032*
Goat	155	128(82.6%)		
Total	410	358(87.3%)		
Sex				
Female	246	222(90.2%)	4.757	.034*
Male	164	136(82.9%)		
Total	410	358(87.3%)		
Age				
Adult	280	247(88.2%)	.642	.429
Young	130	111(85.4%)		
Total	410	358(87.3%)		

* indicates that the P-value is significant

Table 2: Univariate analysis of risk factors with prevalence of GIT parasites

Variable	No of animal examined	No positive (prevalence)	OR	p-value	95% CI
Species					
Goat	155	128(82.6%)	1	1	
Sheep	255	230(90.2%)	1.941	0.026	1.081-3.485
Sex					
Male	164	136(82.9%)	1	1	
Female	246	222(90.2%)	1.904	0.031	1.06-3.42

Table 3: Prevalence of GI parasites in study animals

Types of parasites	Sheep No positive (%)	Goat No positive (%)	Over all (%)
Nematode	159 (62.4)	63 (40.6)	222 (54.1)
Eimeria	31 (12.2)	29 (18.7)	60 (14.6)
Monezia	25 (9.8)	30 (19.4)	55 (13.4)

Table 4: Degrees of GI-Parasitic infestation with different risk factors

	Degree of infestation				
Variable	Light	Moderate	Massive	χ^2	P-value
Species Sheep	55(25.-5%)	137(63.8%)	23(10.7%)		
Goat	30(24.5%)	84(68.9%)	8(6.6%)	3.537	.316
Age					
Adult	55(23.3%)	156(66.1%)	25(10.6%)		
Young	30(29.7%)	65(64.4%)	6(5.9%)	4.570	.206
Sex					
Males	33(26%)	83(65.4%)	11(8.6%)		
Females	52(24.8%)	138(65.7%)	20(9.5%)	3.959	.266
Total	85(25.2%)	221(65.6%)	31(9.2%)		

DISCUSSION

This study revealed the overall GI parasites prevalence of 82.2% with 84.3% and 78.7% in sheep and goats, respectively. Similar prevalence was reported in different parts of Ethiopia and other tropical countries. The result, for example, agrees with prevalence report of 86% from Wolayita [12]. However, the prevalence result of the present study appears to be slightly lower than the prevalence reports in sheep and goats in Gonder (90.4%) [13], Kombolcha (91.43%) [14], Illubabor (90.23%) [15], Wollega-Mechara (96.5%) [16] and Beddelle (91.9%) [17]. The high prevalence observed in different parts of Ethiopia could be ascribed to over stocking, poor nutrition (starvation), poor management practice of the animals (lack of sanitation) and frequent exposure to the communal grazing lands that have been contaminated. Both the chi-square test and univariate analysis revealed higher parasite prevalence and risk in sheep than in goats ($p<0.05$; OR=1.941). This observation is consistent with the assumption of earlier works in other parts of Ethiopia [18] and Kenya [19] that shows higher GI- parasites prevalence is more common in sheep than in goats due to the grazing habit of sheep. The finding also agrees with the work of Yoseph [20] in and around Nekemte and Berry [21] in and around Yabello District, who reported the prevalence of GI- nematode to be more in sheep than in goats. Taken as a whole, the higher prevalence of parasites in sheep than in goats as indicated by the result of this study could be due to the fact that sheep have frequent exposure to communal grazing land that have been contaminated by feaces of infected animals. Goats are browsers in behavior but sheep are grazers from the ground where the GI-parasites egg hatches and reaches the infective stage [19-22]. This observation, however, disagrees with reports from western Oromia [5] and eastern Ethiopia [22] 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.

The analysis result also showed that there was a statistically significant difference ($p<0.05$; OR=1.904) in prevalence between sex of animals; the prevalence was higher in females than in males. This observation agrees with the work of [7] and [20, 23-26] who reported higher prevalence of GI- nematodes in females than in males. These authors stated that female animals are exposed to stress than male animals in different time such as during pregnancy and lactation which favors the egg output of nematodes. The present finding, however, disagrees with reports [27] and [5] which showed that sex of the animals did not show significant association with the prevalence of GI helminthes.

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 [19, 28]. The present finding disagrees with most literatures [5, 29-31] 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 [32]. This finding also contradicts with report of Asanji and Williams [33] 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.

Different investigators put their findings by identifying the nematode genera, but in this study the nematode eggs were identified in general terms as nematode, since nematode eggs cannot be differentiated easily [34]. Among the different parasites, the prevalence of gastrointestinal nematodes was 54.1% followed by Eimeria oocysts (14.6%) using coprological examination. This is in line with the work of [5] who reported nematode (Strongyles) and Eimeria to be the most prevalent parasites encountered in Western Oromia.

The degree (severity) of parasitic infestation was determined from the total fecal egg count (EPG). Out of 337 sampled sheep and goats, 9.2%, 25.2% and 65.6% were respectively infested massively, moderately and lightly. An attempt was also made to see the existence of difference in degree of parasitic infestation with the variation of species, age and sex of the animals. However, there was no significant difference in EPG among different age groups, sex and species. Majority of infected animals had fecal egg count in the range of 800-1200 and only few proportions of animals had fecal egg count of over 1200. This is in line with the work of [17] who reported infestation level of 10.95%, 48.52% and 40.53% as massive, moderate and light level of GI- infestation respectively in and around Bedelle. The Authors also reported the absence of significant difference in EPG among different a ge groups, sex and species. The maintenance of high infestation of GI-parasites in sheep and goats in the study areas was associated with the presence of favorable environmental conditions for the existence and development of the GI- parasites larvae.

CONCLUSION

The present study conducted in Gechi District evidenced that sheep and goats of the area harbor different GI- parasites that could be implicated in the health and production status of the animals. In the present study, the prevalence of parasitosis was 84.3% and 78.7% in sheep and goats, respectively. There was significant difference in the prevalence of the parasites due to species and sex of animals. However, there was no statistically significant difference in infestation between ages of animals. The predominant helminth parasites identified were Nematode, Eimeria and Monezia. The faecal egg count as evidenced by the EPG did not show considerable difference among the age groups, sex and species. Put together, the finding suggests that Gechi district is conducive for the successive maintenance and subsequent transmission of helminth parasites to susceptible hosts. Thus, appropriate parasitosis control strategies need to be implemented in the area to reduce the infestation risk in small ruminants.

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