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Prevalence of Major Gastrointestinal Helminthes in Small Ruminants in Debay Tilatgin Wereda, East Gojjam

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Abstract: A cross sectional study was conducted from October 2018 to December 2018 in Debay TilatgiWereda, East Gojjam zone to determine the prevalence of gastrointestinal helminthes (GIT) infections and associated risk factors in sheep and goats. For this purpose a total of 400 fecal samples were collected (from 260 sheep and 140 goats) and the parasite eggs were examined by using standard parasitological procedures. strongyle type, Fasciola, paramphistomum, trichuris and monezia species were identified in the study area. In the present study the overall prevalence of gastrointestinal helminthiasis was 45.5% (45% and 46.4% in sheep and goats respectively). Relatively higher prevalence of gastrointestinal tract helminthes infection was observed in male animals (50%) compared to female (42.9%). The parasitic load was relatively higher in younger animals than adult animals. Prevalence of gastrointestinal tract helminthiasis was relatively higher in good body condition animals (50.7%) than poor (48.0%) and medium body conditions (40.4%). The prevalence of GIT helminthiasis in lactating animals (68.8%) was higher than the prevalence observed in pregnant (41.2%) and dry animals (38.8%). Animals that grazing in hill side grazing area shows the highest prevalence of helminthiasis than those of animals graze in plain area. The prevalence was much lower in dewormed animals (16%) than animals that have not been dewormed. In the present study only physiological status of female animal and antihelminthic treatment of animals in the last three month-before samplings shows statistically significant ($p<0.05$) difference with prevalence of the GIThelminthiasis. The study showed that gastrointestinal parasites were major problems of small ruminants in the study area. Therefore, awareness creation to the farmers should be instituted in the study area on the effect of gastrointestinal parasites of small ruminants and its control and strategic deworming of small ruminants should be practiced.

Key words: Debay Tilatgin · East Gojjam · Gastrointestinal · Helminthes · Prevalence · Small Ruminants

INTRODUCTION

Ethiopia has the largest livestock population and the highest draft animal population in the continent. There are approximately 52.13 million cattle; 24.22 million sheep 22.6 goats, 1.96 million horse 6.4 million donkey and 368 thousand mules are found in the country [1]. The vast majority of the rural population's livelihood is partly based on livestock production. However, livestock production and productivity and producers' benefits from livestock production are far below expectations [2].

Ethiopia is a home for diverse indigenous sheep and goat populations [2]. Sheep are the predominant livestock in areas over 3000 meter above sea level (masl) and at altitude over 3500 masl farmers keep only sheep [3]. Small ruminants play a major role in the livelihood of smallholder farmers in the highlands of Ethiopia. Around 75% of small ruminants in the country are owned by smallholder mixed crop-livestock farms in the highlands and 25% by pastoralists in the lowlands. A little over 50% are sheep and others are goats [4].

Parasitism is of supreme importance in many agro-ecological zones and still a serious threat to the livestock economy worldwide [5]. Endoparasites are those organisms living within their hosts, in the gut, body cavity, liver, lungs, gall bladder and blood or within the internal cavities, tissues or cells of the host. Such forms nearly always live a completely parasitic existence, since

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they totally depend up on their hosts. There are four major groups of endoparasite: -nematodes, acanthocephalans, platy helminthes (trematodes and cestodes) and protozoan's [6].

Helminthes parasite infections of ruminants are a major problem throughout the world for both small and large scale farmers, but their impact is greater in sub-Saharan Africa in general and Ethiopia in particular due to factors suitable for diversified hosts and parasite species [7]. It is estimated that in Africa as a whole 97% small ruminants are carrier of gastrointestinal helminthes [8]. Economic losses are caused by gastrointestinal parasites in a variety of ways: they cause losses through lowered fertility, reduced work capacity, involuntary culling, a reduction in food intake and lower weight gains, lower milk production, treatment costs and mortality in heavily parasitized animals [9].

The epidemiology of helminthiosis is determined by several factors governed by parasite-host-environment interactions [10]. The major risk factors can therefore be broadly classified as parasite factors (including epidemiology of the different species), host factors (genetic resistance, age and physiological status of the animal) and environmental factors (climate, nutrition, stocking density and management). The importance of helminthosis will vary greatly from one year to the next and between geographical locations depending on the prevailing climatic conditions. Moreover, stress, poor nutrition and concurrent disease may be associated with the release of hypobiotic larvae from the dormant state leading to clinical helminthosis. There is also a great variation in resistance between species [11]. The prevalence of gastrointestinal parasites, the genera of helminth parasites involved, species and the severity of infection also vary considerably depending on local environmental conditions, such as humidity, temperature, rainfall, vegetation and management practices [12].

For successful formulation and implementation of an efficient and effective strategic helminthes control regime, a periodic surveillance of the prevalence of gastrointestinal helminthiasis within given environment and associated risk factors that influence their transmission is required [13, 14]. Although helminth parasites of ruminant livestock are ubiquitous in all of the agro-climatic zones of Ethiopia with prevailing weather conditions that provide favorable condition for their survival and development, their presence does not mean that they cause overt diseases. Prevalence study is very important to assess the type and level of parasitism in ruminant livestock, in order to be able to determine the significance of parasite infections and to recommend the most beneficial and economically acceptable control measures.

Even though, Ethiopia endowed with large number of sheep and goats population, little attempts has been made in the past to study the health aspect of these animals. In various region of Ethiopia the reporting prevalence ranges from 50.4–84.1% [15]. However, these surveys were entirely restricted to the vicinity of veterinary institutions which may not be representative to the various geographical regions of Ethiopia which are unknown before. Lack of well-established data on the magnitude, distribution and predisposing factors of small ruminant GIT helminthes in the study area initiated this study project. Therefore, the general objective of this study is to identify the major GIT helminthes of small ruminants and to determine the magnitude of the infections in the study area.

Therefore, the objectives of the present study were:-

- To identify major GIT helminthes infecting small ruminants in free-range production system in Debay Tilatgin woreda.
- To determine the prevalence of GIT helminthosis in small ruminants and identify associated risk factors.

MATERIALS AND METHODS

Study Area: The cross sectional study was conducted from October 2018 to December 2018 to determine the prevalence of GIT helminth parasites of small ruminant in Debay Tilatgin wereda, East Gojjam, Amhara region. The area is found at a distance of 280 km from Addis Ababa, 285 km from Bahirdar, the regional capital and 30 km away from Debre Markos town. The altitude ranges of study area is 1623 m above sea level with the mean annual rainfall of 1200-1600 mm and the annual minimum and maximum temperatures are 12°C and 31°C respectively. The area marked by two distinct climatic seasons namely, the dry season extended from November to May and the wet season which extended from June to October. Natural broad leaf forests and grasslands cover non-cultivated lands in the area. The main farming system in the area is mixed farming. There are three agro-ecologies (altitudes) Debay Tilatgin wereda namely weyinadega (81.1%), dega (3.8%) and kola (15.6%). The total livestock population of the study area was 191427

which includes cattle, sheep, goat, donkey, horse, mule and, poultry with a population of 90298, 42165, 6126, 11708, 5292, 486, 23644 respectively [16].

Study Population: The study was conducted on local breed of small ruminants (sheep= 240 and goat=150) managed under extensive husbandry system. All animals in selected study area were owned by small holder farmers managed by traditional feeding system which depends mostly on grazing with no supplement and minimum health intervention and care. Animal were composed of different age and body conditions group and both sexes. The body condition score were grouped in to five. Animals that score 0, 1 and 2 are classified as poor, animals that score 3 are classified medium and animals that score 4 and 5 are classified as good body conditions according to [17]. The age of animals was determined based on dental growth and eruption patterns [18]. Animals with age less than one year were considered as young, where as those greater than one year were considered as adult.

Study Design and Sampling Method: A cross-sectional study design method was carried out to determine the prevalence of gastrointestinal helminthes parasite infections of sheep and goats in Debay Tilatgin wereda based on coprological examination. Multistage sampling technique was used to select study kebeles and sample animals and collect the fecal sample from individual study animals. Demographic and other data were collected to identify possible risk factors.

Sample Size: The required sample size for this study was calculated based on the formula described by Thrusfield [19], using 95% confidence interval at 5% desired absolute precision and by assuming the expected prevalence of 50% (since there was no record of previous prevalence of gastrointestinal helminthes parasite in the study area). This is calculated by using the following formula:

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

where,

n = required sample size

P_{exp} = expected prevalence

d^2 = desired absolute precision (usually 0.05)

As a result a total of 384 sheep and goats were required for estimating the prevalence. But a total of 400 fecal samples were collected and examined to study the prevalence of GIT helminthes parasite in small ruminants. Sample size was proportionally distributed to identify number of sheep and goats to be sampled.

Sample Collection and Examination Procedure: Fecal samples were collected per rectum of individual animals using gloved fingers and put into sampling bottles containing 10% formalin and label each sample). During every sampling owner's name, Keble, breed, species, sex, approximate age of individual animals, body condition scores, physiological status of female animal, farm location, antihelminthic treatment and result were recorded on data recording sheet.In the laboratory the preserved fecal samples were subjected to direct fecal smear and concentration methods (modified floatation and sedimentation), to identify parasite eggs following the standard procedures as described by Urquhart *et al.* [20], Bowmans [21] was followed and this methods are shown in (annex 2). Helminthes eggs were identified based on their color, shape and morphological structures [22].

Data Management and Analysis: The data collected from each study animals and laboratory investigation were coded into approximate variable and entered into MS-excel spreadsheet. All statistical analysis was conducted using Strata statistical software package (Stata version 11). Over all prevalence of gastrointestinal helminthes of animals were expressed as percentage by dividing the total number of animals positive to gastrointestinal helminthes parasite to the total number of animals examined times by 100 and the results were presented by using table and percentages are used to describe the results obtained. Ch-square (x^2) test was used to assess the association of the host-related and other management and environmental factors such as sex, species, age group, body conditions scores, Keble, physiological status of female animals and antihelminthic treatment (deworming), farm location and vegetation cover with the prevalence of GIT helminth parasite infections in the study area and to identify risk factors. Logistic regression was used to identify risk factors contributing for the occurrence of GIT helmenthosis. The difference between parameters was tested for statistical significance of the result. For this analysis P-value < 0.05 were considered as significant.

RESULTS

In the present study, a total 0f 400 fecal samples were collected from small ruminants (260 sheep and 140 goats) and examined. Out of 400 samples, 182 (45.5%)

Table 1: Prevalence of major GIT helminthes parasite based on species of animals and parasite

Spp	No. exam.	No. +VE (%)	Trichuris (%)	Strongyles (%)	Monezi (%)	Fasciola(%)
Sheep	260	117(45)	18(15.4)	28(23.9)	12(10.3)	27(23.1)
Goat	140	65(46.4)	9(13.9)	10(15.4)	7(10.8)	13(20)
Total	400	182(45.5)	27(14.8)	38(20.9)	19(10.4)	40(22)

Table 2: The prevalence of major GIT helminthes in small ruminant associated with managmental and environmental factors

Grazing area	No. examined	No. positive	Prevalence (%)	χ^2	P-value
Plain	315	136	43.2	3.23	0.07
Hill side	85	46	54.1		
Plain	315	136	43.2	3.23	0.07
Total	400	182	45.5		

Table 3: The prevalence of major GIT helminthes deworming status

Anthihelmentic treatment	No. examined	No. positive	Prevalence (%)	χ^2	P-value
Dewormed	100	16	16	46.8	0.001
Non-dewormed	300	166	55.3		
Total	400	182	45.5		

Table 4: Prevalence of major GIT helminthes based on species of animal

Species of animals	No. examined	No. positives	Prevalence (%)	χ^2	P-value
Sheep	260	117	45	0.03	0.87
Goat	140	65	46.4		
Total	400	182	45.5		

Table 5: Prevalence of major GIT helminthes based on sex

Sex	No. examined	No. positives	Prevalence (%)	χ^2	P-value
Male	146	73	50	1.88	0.17
Female	254	109	42.9		
Male	146	73	50	1.88	0.17
Total	400	182	45.5		

Table 6: Prevalence of major GIT helminthes based on age

Age	No. examined	No. positives	Prevalence (%)	χ^2	P-value
Adult	236	104	44.1	0.48	0.49
Young	164	78	47.6		
Total	400	182	45.5		

Table 7: Prevalence of major GIT helminthes based on Body condition

Body condition	No. examined	No. positives	Prevalence (%)	χ^2	P-value
Good	73	37	50.7	2.85	0.24
Medium	156	63	40.4		
Poor	171	82	48		
Total	400	182	45.5		

Table 8: Prevalence of major GIT helminthes based on Physiological status of female animals

Physiological status of female animals	No. examined	No. positives	Prevalence (%)	χ^2	P-value
Dry	188	73	38.3	10.04	0.007
Pregnant	34	14	41.2		
Lactating	32	22	68.8		
Total	254	109	42.9		

were positive for GIT helminthes eggs in both species of animals. The results of coprological examination in both sheep and goats have also shown the presence of several genera of GIT helminthes. The identified helminthes were *Strongyle* type, *Fasciola*, *Paramphistomum, Trichuris* and *Moniezia* specie as single and mixed infections (Table 1). From 260 sheep examined for GIT helminthes parasite 100 (38.46%) were infected with at least one species of helminthes parasite and 17 (6.5%) were infected with two or more species of parasites. Out of the total 140 goats examined, 54 (38.6) were infected with at least one species of parasite while 11 (7.9%) were infected with

two or more species of GIT helminthes. Out of the total positive cases in both sheep and goat *Fasciola* Spp (22.0%), were the highest proportion followed by *Strongyle* type Spp (20.9%), *Paramphistomum* Spp (16.5%), *Ttrichuris* Spp (14.8%) and *Monezia* Spp (10.4%) (Table 1).

The study shows that there was a variation in the distribution of gastrointestinal helminthes infections of the examined animals by grazing area. The highest prevalence of helminthiasis was found in hill side grazing area than plain area as shown (Table 2). However, the difference in prevalence between farm location was not statically significant (χ^2 = 3.23 and p>0.05) as the result shows in (Table 3).

The prevalence of parasitic infections in the study area was much lower in dewormed animals (16%) than animals that have not been dewormed (55.3%) in the last 3 months before sampling. However, the difference in prevalence between the two groups of animals was statically highly significant (χ2 = 46.8 and p<0.05) as the result shows in (Table 4).

The prevalence was higher in goats (46.4%) than sheep (45%). There was no statisticaly significant difference on the prevalence of GIT helminthes parasite infection between the two small ruminant species (χ^2 = 0.03; p>0.05) (Table 4). In this study, assessment was made to see the effect of sex on the disease prevalence. Relatively the higher prevalence of GIT helminthes infection was observed in male animals (50%) compared to female (42.9%), but the prevalence difference between sex groups was not statistically significant (χ^2= 1.88 and p>0.05) (Table 5). The overall parasitic load in the study area was relatively higher in younger animals than adult animals. The prevalence in the younger animals was 47.6% while in the adult animals was 44.1%. However, the difference in prevalence between the age groups was not statically significant (χ^2 = 0.48 and p>0.05) (Table 6).

Relatively higher prevalence of GIT helminthiasis was observed in good body condition animals (50.7%) compare to poor body conditions (48.0%) and medium body conditions (40.4%). However, the difference in prevalence between body condition was not statically significant (χ^2 = 2.85 and p>0.05) (Table 7). The prevalence of GIT helminthes parasites with association of physiological status of female animals was assessed in this study (Table 8). The result indicates that the prevalence of GIT helminthiasis in lactating animals (68.8%) was higher than the prevalence observed in pregnant (41.2%) and dry animals (38.8%). The difference between the prevalence of GIT helminthes parasites in physiological status of female animals was statically significant (χ^2 = 10.04 and p<0.05) (Table 8). Generally among host-related factors only physiological status of female animal show significant difference for the prevalence of helminthiasis in the small ruminants.

DISCUSSION

The overall prevalence of GIT helmenthiasis in small ruminants in Debay Tilatgin wereda was 45.5%. In this study five types of parasites were identified based on their morphology described by Urquhart *et al.* [20], Hansen and Perry [23]and Perry *et al.* [24]. The identified GIT helminth parasites in both species of animals in this study were *Fasciola* spp, *Strongyle* type spp, *Trichuris* spp*, Moniezia* spp and *Paraphistomum*. This result is comparable with report of Welemehret *et al.* [25] in and around Mekelle. The similarity may be due to the presence of similarity in the management and environmental condition in the study area and around Mekelle. In the present study the most prevalent gastrointestinal helminthes parasite species in small ruminants was *Fasciola* spp but Hailegebraelt *et al.* [25] in Afar Region, Ethiopia reports; *strongyle* type spp were the most prevalent gastrointestinal helminth species. This difference may due to the presence of higher water body and marshy area which is suitable for the presence of intermidate host of snail. The presence of marshy areas is favorable habitat of the intermediate host of *Fasciola* Petros and Lakew [26].

With respect to the species prevalence of GIT parasites, 117(45%) sheep and 65(46.4%) goats were found to harbor one or more parasites. This result was much lower than the reports of Gebreyesus [27], Esayas [28], Zelalem andMohammed l [29], Melkamu [30], Bayou [31], Yoseph [32], Genene [33], Nuraddis et al [34], Hailelul [35] and Tefera *et al.* [36]. They have reported a prevalence of 96.4% in goats of Ogaden range lands, 90.41% and 82.13% in sheep and goats in and around Wolayita Soddo, 88.1% and 84.32% in sheep and goats in and around Mekelle, 91.4% in sheep in and around Kombolcha, 90.9% and 94.9% in sheep and goats of Gondar, 92.2% and 94.1% in sheep and goats of Mendayo district of Bale, 93.2% and 92.2% in sheep and goats of four Awrajas of Eastern Showa, 90.2% and 88.3% in sheep and goats of Buno province, 85.8% in sheep in and around Asella and 91.32% and 93.29% in sheep and goats in and around Bedelle, respectively. The existence of unfavorable climatic or environmental factors affects the prevalence helminthiasis [37, 38]. This deference could be

due to variation in study site, season, sample size, animal husbandry and management practice in the study area. In addition the decrease in prevalence may be due to the increase of awareness of the people and establishment of many veterinary clinics around rural area of the country.

In the present study, the prevalence of helminthiasis among sheep and goat was almost similar but relatively higher prevalence in goats than sheep, which is in agreement with report of Fikru *et al.* [12] in the west, Sisay *et al.* [39], Abebe and Esayas [40] in the eastern parts of Ethiopia, Bikila et al [41] in Gechi District, Southwest Ethiopia and elsewhere [42]. And this is assumed to be due to the communal grazing area of sheep and goats practiced in the study area could put the goats in a risk of acquiring the infection from the sheep [43]; furthermore, it is assumed that sheep do have a considerably higher immunological response to gastrointestinal parasites compared with that of goats [20]. The higher prevalence in goat may be because the majority of the goats are kept under poor veterinary infrastructure and medication. More importantly, this may be due to limited immunological response in goats for helminthes infections compared to sheep due to low or slow development of immunity in goats for GIT parasites than sheep [20]. The present results however, contradicts to the finding of Tekly [44] and elsewhere in the world [45] whose assertions explained that the grazing habits of sheep (grazing closer to the earth soil) fostering opportunity of exposure to parasites than goats.

In the present study the prevalence of GIT helminth parasitism was higher in male than female. But the sex of the animal did not show significant association with the prevalence of the parasites. This result agrees with Gauly *et al.* [46]and Raza *et al.* [47] report but Regassa *et al.* [15]and Keyyu *et al.* [42] reported a higher prevalence of helminth infection in females than male. The lower prevalence in female may be due to the repeated deworming of adult females and most of the male animals may not be dewormed until slaughter because of most male animals slaughter at lower age than female.

In the present study, age seems to have no significant influence on the prevalence of helimenthiasis but the prevalence was relatively higher in young animal than adult, which could be related to the higher susceptibility of younger animals. This report is in agreement with reports in north and west Ethiopia [15, 43]. Age was considered an important risk factor in GIT helminthiasis [47]. Several authors have documented that adult and old animals develop acquired [20]. Against helimenth infections as they get mature due to repeated exposure [43] and this will help expel the parasite before it establish itself in the GIT. On the contrary, there are instances where younger animals were reported to be resistant to parasitic infection [12].

In this study, a significant difference was observed in helminth infection in relation to physiological status of female animals and a higher prevalence of helminthiasis was recorded in lactating animals followed by pregnant and dry animals. This supports with the general understanding of helminth infections that lactating and pregnant animals are more susceptible to helminthiasis than dry [42]. Females are more to parasitism during pregnancy and peri-parturient period due to stress and decreased immune status [20].

In the present study, body conditions seems to have no significant influence on the prevalence of helimenthiasis but relatively higher prevalence of helminthiasis was observed in good body condition animals compared to poor and medium body condition animals which is in agreement with previous reports [15, 42] however, contradicts to the finding of Tekly [44]. This poor body condition might be due to malnutrition, other diseases rather than helminthiasis in addition to this most of the time the farmers deworms only poor and medium body condition animals than good body condition.

In the present study, the level of prevalence was compared between animals graze in plain area and hill side area. The prevalence was higher (54.1%) in small ruminants kept under hill side area than those kept in the plain area but the difference between the prevalence was statistically not significant. This agrees with Kantzoura *et al.* [48] in which, Farms located on high elevation had a higher prevalence of GI helminth infections. Apparently high elevation areas have favorable climatic conditions for the development of the free-living stages of the GI nematodes. The difference of prevalence between grazing area may arise from the presence of high water body and marsh area in the high elevation area

Statistically highly significant variation ($p<0.05$) was observed between deworming and not dewormed sheep and goat within the past 3 month. Higher prevalence of helminthiasis was observed in animals that were not dewormed within the past 3 month. This finding was consisted with Hansen and Perry *et al.* [24] with the treatment being designed to reduce both pasture contamination and host infection.

CONCLUSION AND RECOMMENDATION

In general, the overall prevalence of gastrointestinal helminthes parasites in the study area indicates gastrointestinal helminthiasis to be an important health problem of small ruminants in the area affecting the wellbeing of the animals. During the present study an overall prevalence of 45.5% with 45% in sheep and 46.4% goats were harboring one or more GIT parasites. There is no significant difference in the prevalence of gastrointestinal helminthes parasites due to the presence of species, age, body condition, sex, grazing type and kebele difference but the prevalence was varies among these risk factors. In this cross sectional study only physiological status of female animals and antihelimentics treatments should have a potential significant difference effect on the prevalence of GIT helminthes parasites in sheep and goat. In the study area the type of grazing system was communal type of grazing due to this reason polyparasitisim is a common problem in both sheep and goat population.

Therefore based on the above conclusion the following recommendations are forwarded:

- Awareness creation to the farmers in the study area on the effect of GIT parasite of small ruminants and its control.
- Strategic deworming of animals, when conditions are most favorable for larval development on the pasture, using broad spectrum anti-helminthics since polyparasitism is a common problem.
- Proper pasture and animal management is a key component to managing gastrointestinal helminths in sheep and goat operations.
- Rotation grazing is used in interval and avoids communal grazing with other animals to avoid cross parasite contamination.

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