

# SMALL RUMINANT GIT PARASITES IN ENEMAY DISTRICT, ETHIOPIA: PREVALENCE AND RISK FACTORS

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**ABSTRACT:** A cross sectional study was conducted to determine the prevalence and risk factors associated with small ruminants GIT helminthes parasites in Enemay district, East Gojjam, Northwest of Ethiopia from October, 2013 to April, 2014 based on coprological examination. A total of 384 small ruminants' faecal samples (248 sheep and 136 goats) were collected and examined using standard parasitological procedures of sedimentation and flotation techniques. The present study revealed that the overall prevalence of the major gastrointestinal tract (GIT) helminthes parasite was 229 (59.63%). Out of 229 positive samples the species of parasites were found *Strongyle* (22.9%), *Fasciola* (14.1%), *Paramphistomum* (7.03%), *Monesia* (5.73%) and as mixed infection (9.9%). *Strongyles* were the most prevalent parasites encountered in the area followed by *Fasciola*. The study showed that 63.7% and 52.2 % of sheep and goats, respectively were infected with one or more helminthes and higher prevalence was observed in sheep than goats and there was statically significant ( $P<0.05$ ) between them. Female animals were found with higher prevalence of helminthes infection rate than male animals with a prevalence of 59.9% and 40.1%, respectively and there was statically significant ( $P<0.05$ ) between sex. Higher prevalence was observed in young animal than adult animal in this study and the prevalence was 67.9% and 53.6%, respectively. There was statically significant ( $P<0.05$ ) between age group. The study showed that higher prevalence of helminthic infection was observed in poor body condition animals as compared to medium and good body condition animals and their prevalence were 89.9%, 59% and 44% respectively. There was highly statically significant ( $P<0.0001$ ) between body condition of the animal. In Conclusion the animal was affected by different helminthes parasites infections which cause loss of production, reducing growth rate and death of small ruminants. The animal owner should be deworming their small ruminants by different anthelmintics based on order of the Veterinarian to avoid drug resistance as recommendation.

**Keywords:** GIT helminthes, Prevalence, Small ruminants, Enemay district, Ethiopia

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## INTRODUCTION

The livestock sector is a massive transformational state to meet increased demand of animal origin foods for increasing human population (Karim et al., 2008). Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. It is eminent that livestock products and by-products in the form of meat, milk, honey, eggs, cheese, and butter supply etc provide the needed animal proteins that contribute to the improvement of the nutritional status of the people. Livestock also plays an important role in providing export commodities, such as live animals, hides, and skins to earn foreign exchanges to the country. Ethiopia has an estimated of 53.4 million Cattle, 25.5 million sheep, 22.78 million goats, 2 million horses, 6.2 million donkeys, 0.38 million mules, about 1.1 million camels and 49.3 million poultries (CSA, 2011).

Sheep and goat production play an important role in the livelihood security and economic sustenance of poor farmers in semiarid, arid, hilly and mountainous regions of the world. These animals survived under low input

system depending mostly on seasonal grasses, and crop straw (Karim et al., 2005). Sheep and goats are widely adapted to different climates and are found in all production systems. They also have lower feed requirements as compared to cattle because of their small body size. This allows easy integration of small ruminants into different farming systems (Alemu and Markel, 2008). Parasitic helminthes or worms are an important cause of disease in all species of animal. Although in many cases they produce little serious damage to the host, these parasites are never beneficial in some cases they can produce severe and even fatal disease (Jones et al., 1996).

Helminthes infections, or helminthosis, thus refer to a complex of conditions caused by parasites of the Nematoda, Cestoda and Trematoda. Although all grazing sheep and goats may be infected with the above-mentioned parasites, low worm burdens usually have little impact on animal health. But as the worm numbers increase, effects in the form of reduced weight gain and decreased appetite occur. With heavier worm burdens clinical signs such as weight loss, diarrhoea, anaemia, or sub-mandibular oedema (bottle jaw) may develop (Sissay, 2007).

The gastro-intestinal tract may be inhibited by many species of parasites. Their cycle may be direct which eggs and larvae are passed in the feces and stadia development occurs in to the infective stage, which then ingested by the final host. Alternatively the immature stage may be ingested by an intermediate host (usually invertebrate) in which further development occurs and an infection is acquired when the intermediates or free living stages shed by the host is ingested by final host. In host, resistance, age, nutrition and contaminant disease also influence the course of parasitic infection. The economic importance of subclinical parasitism in farm animal is also determined by the above factors, and it is well established that highly parasitized animal that show no clinical signs of the disease perform less efficiently in the feedlot, dairy or finishing (Kahn et al., 2005).

Gastrointestinal parasites infections are a world-wide problem for both small and large scale farmers, but their impact is greater in sub-Saharan Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species. 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, lower weight gains, lower milk production, treatment costs, and mortality in heavily parasitized animals (Fikru et al., 2006). In Ethiopia, 5-7 million sheep and goats die each year due to diseases including helminthes infections. More significant, however, are losses resulting from inferior weight gains, condemnation of organs and carcasses and lower milk yields. The overall economic loss to the Ethiopian meat industry due to parasitic diseases is estimated at US\$ 400 million annually (MOARD, 2007).

Sheep and goats harbor a variety of gastrointestinal tract (GIT) parasites, many of which are shared by both species. Among these parasites, helminthes are the most important GIT parasites that affect the growth as well as production of the animals. Gastrointestinal nematodes of *Trichostrongylidae* family are perhaps the most important parasites of small ruminants worldwide, causing significant morbidity and loss of production. Helminthic infections can be treated by anthelmintic, however, treatment is costly and drug resistance has evolved in all major parasite species (Ijaz et al., 2009).

Parasitic infection ranges from acute disease frequently with high rates of mortality, chronic disease, resulting in various degrees of morbidity and premature culling to sub clinical infection with sheep appearing relatively healthy but frequently performing below their full potential. The parasitic helminthes of small ruminant can be sub divided into nematodes (round worm), trematode (flukes), and cestodes (tapeworms) (Aitken, 2007). It is impossible to give an accurate estimate of the economic importance of parasite diseases because it varies so greatly between countries and between region, depending both on climate and on the intensive farming in the area (Radostits et al., 1993). In the varied agro-climatic zones of Ethiopia, small ruminants are important source of income for rural communities and are one of the nation's major sources of foreign currency from exports. In Ethiopia about 8 millions of small ruminants are slaughtered annually and providing more than 30% of domestic meat consumption. The rich potential from the small ruminant sector is not efficiently exploited; however, due to several constraints, including malnutrition, inefficient management and diseases (Abebe and Esayas, 2001).

Enemay district has 71432 small ruminants, of which 61233 sheep and 10199 goats which are managed under extensive management system. The sheep and goats provide cash income, meat and skin to the Enemay district society and to different hotels in Bichena town. The animal mostly affected by different disease due to suitability of the district to different disease epidemiology including helminthic infection and their productivity is low. But there is not enough information about the prevalence of major GIT helminth parasites of small ruminants in the district. Therefore the objectives of this study in the study area were to determine the prevalence of gastrointestinal parasite of small ruminants in the study area and to assess the major risk factors associated with prevalence of GIT parasites of small ruminants.

## MATERIAL AND METHODS

### Study area

The study was conducted from October, 2013 to April, 2014 at Enemay district which is found in East Gojjam administration zone, in Amhara region at 265km in Northwest of Addis Ababa. The mean annual temperature of the district is 21°C and annual rain fall is 815-1440 mm. It lies at 10°27'North 38°12'East latitude and longitude respectively and 2572 meter above sea level. Enemay district has 108224 of livestock population of which 71432 small ruminants that managed under extensive management system. The animal used as cash income, draught power, and as food source in the form of meat, milk and egg (EWARDO, 2012).

### Study animals

The study animals were small ruminants (sheep and goats) in Enemay district which are managed under extensive management system. These animals are maintained in small households flocks of mixed age group and sex. The number of goat is decrease as increase altitude while the number sheep increase. All the sheep and goats that the sample collected was indigenous breed and the animal was classified as young ( $\leq 1$  year) and adult ( $> 1$  year) according to (Berisa et al., 2011) and age was estimated based own owners knowledge and pattern of incisor eruption (MOARD, 2009) and body condition can be classified as poor, medium and good according to (Asmare et al., 2012) and body condition Scoring is based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region (Thompson and Meyer, 1994).

### Sample size determination

The sample size required for this study was determined based on sample determination in random sampling with expected prevalence of major gastro intestinal helminthes of small ruminant in the study area is 50% which no previous know prevalence and at 5% desire absolute precision and 95% confidence level according to Thursfield, (2005). Therefore, the sample size of 384 small ruminants (248 sheep and 136 goats) was obtained by using formula for sample size determination as given below as follow.

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

Where:

n = required sample size,

P<sub>exp</sub> = expected prevalence = 50%

d = desired absolute precision = 5%

### Study design

The study design was cross-sectional which carried out to determine the prevalence of major GIT helminthes parasites of small ruminants and to assess associated risk factor based on coprological examination.

### Sample collection and coprological examination

The sample was collected from 384 small ruminants (248 sheep and 136 goats) directly from the rectum which is placed on sample container bottle with 10% formalin as preservative. During sample collection, date, sex, species of animal, age, and body condition of the animal were properly recoded. After collecting the sample was examined by flotation and sedimentation technique at Enemay district Veterinary clinic with a standard parasitological procedure described by (Hansen and Perry, 1994). Eggs of the different helminthes were identified on the basis of morphological appearance and size with the help of keys (Urquhart et al., 1996).

### Data entry and analysis

All collected data were entered to Micro- Soft Excels sheet version 2007 and analyzed by SPSS version 20. Descriptive statistics was used to determine the prevalence of the parasites and Chi-square test was used to assess the association of the potential risk factors with the prevalence of the parasites. For statistical analysis a confidence level of 95% and P-values less than 5% ( $P < 0.05$ ) was considered as significant.

## RESULTS

Out of the total 384 (248 sheep and 136 goats) small ruminants examined over the study period, 229 (59.63%) were found to harbor one or more parasite species. Out of the total of 248 (63.7%) of the sheep and 136 (52.2%) of the goats studied were found to harbor one or more parasite species. There was statically significant between the two species ( $\chi^2 = 4.829$ , and  $P < 0.05$ ; Table 1). The prevalence of major GIT helminthes parasite in

relation to sex, 59.9% in female and 40.15 in male were observed. Higher prevalence was recorded in female (59.9%) than in male (40.1%) and there was statically significant between sex ( $\chi^2=9.77$ , and  $P<0.05$ ; Table 2). The prevalence of major GIT helminthes parasite in different age group were 67.9% in young and 53.6% in adult sheep and goat and there was statically significant between age ( $\chi^2=7.954$ , and  $P<0.05$ ; Table 3).

Higher prevalence was observed in poor body condition (89.9%) as compared to medium (59.7%) and good (44%) body condition. There was also highly statically significant between body condition ( $\chi^2=39.734$ , and  $P<0.000$  (Table 4). The distribution of different classes of helminthes parasites of small ruminant in the study area were nematodes (*Strongyle* type) followed by trematodes (*Fasciola* and *Paramphistomum*) and cestodes (*Monesia*) in both host species. The overall prevalence of the parasite based on specie of parasite was 22.92% *Strongyle*, 14.1% *Fasciola*, 7.03% *Paramphistomum*, and 5.73% *Monesia*. The infection of helmenthiasis which include more than one types of parasite was found in 9.9% of the examined animals. Of this the infection of *Fasciola* and *Paramphistomum* were the highest concurrent infection followed by *Fasciola* and *Strongyle* species (Table 5).

**Table 1 - Prevalence of major GIT helminthes parasite based on species small ruminant**

Species	No. examined	No. positive	Prevalence (%)	$\chi^2$	P-value
Sheep	248	158	63.7	4.829	0.028
Sheep	136	71	52.2		
Total	384	229	59.6		

\*P < 0.05; = significant

**Table 2 - Prevalence of major GIT helminthes parasite based on sex of the animal**

Sex	No. examined	No. positive	Prevalence (%)	$\chi^2$	P-value
Female	230	152	59.91	9.77	0.0002
Male	154	77	40.1		
Total	384	229	59.63		

\*P < 0.05; = significant

**Table 3 - Prevalence of major GIT helminthes parasite based on age**

Age	No. examined	No. positive	Prevalence (%)	$\chi^2$	P-value
Young	162	110	67.9	7.954	0.005
Adult	222	119	53.6		
Total	384	229	59.63		

\*P < 0.05; = significant

**Table 4 - Prevalence of major GIT helminthes parasite based on body condition**

Body condition	No. examined	No. positive	Prevalence (%)	$\chi^2$	P-value
Poor	69	62	89.9	39.734	0.000
Medium	181	108	59		
Good	134	59	44		
Total	384	229	59.63		

\*P < 0.05; = significant

**Table 5 - Prevalence of major GIT helminthes parasite based on species of animal and parasite**

Species	No. positive	Strongyle (%)	Fasciola (%)	Paramphistomum (%)	Monesia (%)
Sheep	158	61(38.61)	38(24.1)	20 (12.7)	17(10.8)
Goat	71	27(38.03)	16(22.53)	7(9.86)	5(7.04)
Total	229	88(38.42)	54(23.5)	27(11.8)	22(9.6)

\*P < 0.05; = significant

## DISCUSSION

The present study revealed that the overall prevalence of GIT helminth parasites was 59.63% in the small ruminants examined. This finding is comparable with the finding of (Tesfaheywet, 2012) reported 61.4%, in Haremaya, South Eastern Ethiopia and lowered than the results of other studies in sheep and goat carried out in different part of Ethiopia (Bersissa et al., 2011) 70.2% in Central Oremia, (Nuraddis et al., 2014) 87.2% around Jimma town, Western Ethiopia, (Bikila et al., 2013) 87.3% in Gechi District, Southwest Ethiopia and elsewhere in the world (Pant et al., 2009) 96.0% in Tarai region of Uttarakhand, and (Kuchai et al., 2011) 69.7% in Ladakh, India. The current lower prevalence finding might be due to now a day the animal owner manages their animal properly by regular deworming by different anthelmintics during different season of the year, proper feeding of their animal that helps the animal to protect themselves from different helminthes infection by developing rapid immune response to the parasite. Different parasites require different agro climate for multiplication and survival of the infective stage of the parasite and infect the animal and this area might be do not allow this things for the parasite. The present study showed that 63.7% and 52.2 % of sheep and goats respectively are infected with one or more helminthes and higher prevalence was observed in sheep than goats which is agreed with other studies that reported higher prevalence in sheep than goats (Bikila et al., 2013) which is 90.2% and 82.6% in Gechi District, Southwest Ethiopia, (Welemehret et al., 2012) 56.25% and 35.33% in and around Mekelle Town, Northern Ethiopia, (Nuraddis et al., 2014) 89.3% and 87.1% around Jimma town, Western Ethiopia and elsewhere in the world (Mbuh et al., 2008) 96.25% and 86% in Bokova, a rural area of Buea Sub Division, Cameroon, in sheep and goats respectively. This is higher prevalence in sheep might be due to the grazing habit of sheep when they graze closer to the ground might be consumed the infective stage of the parasite with the grass from the ground where as goats are mostly not grazing close to the ground rather they are brose the leaf of the tree which is above the ground that prevent themselves from exposure to the infective stage of the parasites.

Female animals were found with higher prevalence of helminthes infection rate than male animals and there was statically significant ( $P < 0.05$ ) between them in the present study. The prevalence of GIT helminthes parasite in this study in female and male animal was 59.9% and 40.1% respectively. This finding agreed with other studies which are reported higher prevalence in female than male (Tesfaheyw et al., 2012) 62.53% and 60.41% in Haremaya, South Eastern Ethiopia, and (Shimelis et al., 2011) 48.80% and 42.42% in North Gondar zone, Northwest Ethiopia in female and male animal respectively. The higher prevalence in female animals observed in the study due to male animals are slaughter early and more samples were collected from the female, and female animals immunity may be lowered than male animal during lactation and pregnancy and also male animals are kept indoor for the purpose of fattening where as female animals are not manage just like a male animal which are kept on communal grazing on the field.

Higher prevalence was observed in young animal than adult animal in this study and there was statically significant ( $P < 0.05$ ) between age group. The prevalence of GIT helminthes parasite in this study young and adult animal was 67.9% and 53.6%, respectively. This study is similar to other finding that reported higher prevalence in young animal than adult animal such as (Welemehret et al., 2012) 56.25% and 35.33%, in and Around Mekelle Town, Northern Ethiopia, (Diriba and Birhanu, 2013) 79.6% and 62.4% in and around Asella, South Eastern Ethiopia. This might be due to young animals are susceptible to different diseases including parasitic infection due to low development of immune response to the infection, lack of adaptation and resistance before they exposure to infection whereas adult animals are resistant and adapted to infection due to rapid response of immunity to the infection due to previous exposure of infection which remove the parasite before it attach to its predilection site.

The study showed that higher prevalence of helminthic infection was observed in poor body condition animals as compared to medium and good body condition animals and there was highly statically significant ( $P < 0.000$ ) between body condition. The prevalence of helminthes parasite in these studs in relation to body conditions 89.9%, 59% and 44% in poor, medium and good body condition. This finding is similar to other studies which is (Diriba and Birhanu, 2013) 81.3%, 69.5%, and 61.5% in and around Asella, South Eastern Ethiopia in poor, medium and good body condition respectively. The higher prevalence in poor body conditions might be caused by due to malnutrition, other concurrent diseases or current parasitic infection that lead to lower the immune status of the animal to different diseases or infective stage of the parasites (Welemehret et al., 2012).

The major helminthes parasite that has been observed in this study were *Strongyle* type of species (Nematodes), *Fasciola* and *Paramphistomum* species (Trematode) and *Monesia* species (Cestode) parasites of small ruminant in this area. The overall prevalence of this parasite in this animal was 22.92% *Strongyle*, 14.1% *Fasciola*, 7.03% *Paramphistomum* and 5.73% *Monesia* species of helminth parasite in small ruminants. This finding agreed with (Welemehret et al., 2012) in and around Mekelle Town, Northern Ethiopia, and elsewhere in the world (Lone et al., 2012) in Ganderbal, Kashmir. The highest prevalence was seen in *Strongyle* type of parasite than other helminth parasites this might be due to the area is suitable to the survival of the infective stage of the



parasite which means there was optimal moisture and temperature that helps the egg of parasite to hatched and develop the infective stage outside the definitive host. The development of larvae in the environment depends upon warm temperature and adequate moisture. In most tropical and sub-tropical countries, temperatures are permanently favourable for larval development in the environment. The survival of larvae in the environment depends upon adequate moisture and shade. Desiccation from lack of rainfall kills eggs and larvae rapidly and is the most lethal of all climatic factors. Larvae may be protected from desiccation for a time by the crust of the fecal pat in which they lie or by migrating into the soil (FAO, 2012).

## CONCLUSION AND RECOMMENDATIONS

Enemay district has large number of small ruminant that are managed under extensive management system in mixed farming system that serve as source of food and cash income for rural society of the district. The small ruminants was affected by different helminth parasites such as *Strongyle* type, *Fasciola* species, *Paramphistomum* and *Monesia* specie of parasite and sometimes by mixed parasitic infection, Strongyles were the most prevalent parasites encountered in the area followed by *Fasciola*, which causes loss of production, reducing growth rate and death of small ruminants due to lack of proper management like regular deworming, improper feeding, animals are keeping on communal grazing on the field and lack of adequate animal health and production extension workers that give to advise to the animal owner. Based on the above conclusion the following recommendations are forwarded: Strategic deworming of small ruminants using a broad spectrum anthelmintics should be practiced, the government should be creating awareness to the animal owners to avoid communal grazing and keep their animal indoor to improve the production and productivity of the animal, the animal owner should be restricted their animal to go the field during parasitic season of the year and further studies on epidemiology of GIT helminthes parasite of small ruminants should be conducted on the study area.

### Author's contribution

A Shime performed the data collection, laboratory works and write up of the manuscript. S Derso analyzed the data and revised the manuscript. All authors read and approved the final manuscript.

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### Conflict of interests

There is no conflict of interest in publishing this article.

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