Prevalence and Associated Risk Factors of Gastrointestinal Parasite in and Around Ada’a Woreda

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Abstract

Gastrointestinal nematodes of small ruminants are one of the important parasitic diseases that result in reduced productivity. A cross-sectional study was conducted from November 2018 to April 2019 in Ada’a district of East Showa zone. The objectives of this study were to determine the prevalence of GINs in small ruminants, to assess some of the associated risk factors, and to identify the nematode genera involved by fecal examination. A total of 206 randomly sampled sheep and goats were undergone coprological examination by simple floatation technique and 126 (61.2%) of examined animals were found positive for one or more genera of GINs. Specifically, a prevalence of 61.4% (102) in sheep and 60% (24) in goats was recorded. This study revealed that sheep and goats in the study area were infested by a variety of GINs, containing the genera of Haemonchus (25.2%), Oesophagostomum (11.7%), Strongyloides (7.3%), Trichostrongylus (6.3%), Trichuris (3.9%) and Bunostomum (1%) in descending order of prevalence. However, Trichuris and Bunostomum were not detected in samples from goats. Sex wise prevalence of 57.5% in male and 63.2% in females were obtained. Based on age the prevalence of GINs was 73.3% and 56.2% in young and adult age groups respectively, and the difference was statistically significant (p<0.05). Body condition score infection rate was 70.6%, 69.7%, and 51% in poor, medium, and good body conditioned animals, respectively. Animals with poor body condition were significantly more infected (p < 0.05) than those in medium and good body conditions. In this study, sex, origin, and species of the animals were not found statistically significant with the prevalence of GINs (p > 0.05). Counts of Strongyle eggs revealed that 39.3%, 12.6%, and 9.2% of examined animals were found to be lightly, moderately, and massively infested, respectively. In general, this study showed that GIN infections pose a serious health threat and remain one of the major impediments to small ruminant production in the study area. Therefore, economically feasible, effective management and strategic de-worming of small ruminants should be implemented for the prevention and control of the disease.

Key words: Ada’a, Gastrointestinal, Nematodes, Prevalence, Risk factors, Small Ruminants.

Original Article

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Introduction
Livestock production constitutes one of the principal means of achieving improved living standards in many regions of the developing world. In Sub-Saharan African countries the livestock sector contributes 13-16% of total agricultural Gross Domestic Product (GDP) and is becoming the fastest growing sub-sector of agriculture (Kefyalew and Tegegne, 2012). Small ruminant farming has a prominent role in the sustainability of rural communities around the world (Park and Haenlein, 2006), as well as being socially, economically, and politically highly significant at national and international levels, as with all livestock species. Africa hosts 205 and 174 million sheep and goats representing 17% and 13% of the world’s total small ruminant population, respectively. The population of small ruminants in sub-Saharan Africa is estimated to be 274 million (Leta and Mesele, 2010).

Sheep and goats have great importance as major sources of livelihood and contribute to the sustenance of landless, smallholder, and marginal farmers especially to the poor in the rural areas throughout the developing countries. In Ethiopia, small ruminants play an important role in all agricultural production systems, thrive and produce in all agro-ecological zones. They are very important for resource-poor smallholders of rural Ethiopia due to their ease of management, short generation cycles, and high reproductive rates which lead to high production efficiency and a significant role in the provision of food and generation of cash income. They serve as a living bank for many farmers, closely linked to the social and cultural life of resource-poor farmers, and provide security in bad crop years (Tsedeke, 2007).

Although Ethiopia is endowed with the highest population of small ruminants in Africa, with 24.2 million sheep and 22.6 million goats (CSA, 2012), the benefit the country is obtaining from the resource is below expected due to multitude of factors like diseases, poor nutrition, poor animal production systems, reproductive inefficiency, management constraints and lack of veterinary care. Diseases are among the most important constraints affecting the productivity of small ruminants in Ethiopia (Zewde and Ledatu, 2008 and Petros et al., 2014). Among diseases, helminthosis are perhaps the most prevalent and cause huge economic losses due to mortality and morbidity (Kaur et al., 2008 and Kaur et al., 2013).

Due to suitable geographic and climatic conditions of the country, parasitic Gastrointestinal Nematodes (GINs) are perhaps the leading cause of productivity losses in small ruminant production in Ethiopia (Biffa et al., 2007). Parasitological investigations carried out in different regions of the country have demonstrated the existence of a wide range of GINs in small ruminants which includes the genera of Haemonchus, Teladorsagia, Trichostrongylus, Oesophagostomum, Bunostomum, Strongyloides, Cooperia, Nematodirus and Trichuris (Abebe and Esayas, 2001 and Sissay et al., 2007). Sheep and goats share most of these parasites. However, the prevalence, the genera of nematode parasites involved and the severity of infection vary considerably from region to region, corresponding to ecological and climatic diversity in the country (Biffa et al., 2007).

Although considerable work has been done on helminthosis of sheep and goats in many parts of Ethiopia, there was no recent and well-organized data on the prevalence of GINs, the parasite species composition, and associated predisposing factors in small ruminants in the present study area. However, given the huge economic burden of the disease, knowing the current situation of GINs is of paramount importance to generate accurate information about the disease and thereby design effective disease prevention and control strategies accordingly.
Therefore, the Objectives of the Present Study Were:
- To determine the prevalence of GINs infestation in small ruminants
- To identify the involved GIN genera in the study area
- To assess major risk factors for the prevalence of GINs
- To formulate possible control and prevention strategies of GINs in the area.

Material and Methods

Study Area
The study was carried out from November 2018 to April 2019 in 3 purposively selected Peasant Associations (PAs) such as Dembi, Godino and Dalo, and Bishoftu town of Ada’a District, East Showa Zone, Oromia, Central Ethiopia. Ada’a district is located at a distance of 47 km South-Eastern part of Addis Ababa. The area lies between 9° N latitude and 39° E longitude with an altitude of 1920 meter above sea level. It gets an annual rainfall of 871 mm3 of which 80% is received during long rainy season starting from June to September and the remaining in short rainy season extending from March to May and the dry season from October to February. The mean annual maximum and minimum temperatures are 26 and 14°C, respectively with a minimum relative humidity of 63.8% (NMSA, 2013). The estimated animal population in the area is about 160,697 cattle, 22,181 sheep, 37,510 goat, 5660 horse, 38,726 donkey, 268 mule and 191,380 poultry (CSA, 2008).

Study Populations
The study population includes sheep and goats of different age groups, body conditions, and both sexes kept under extensive management systems from three purposively selected PAs of Ada’a district and Bishoftu town.

Study Design
A cross-sectional study design was used for the prevalence determination of GINs in sheep and goats by coprological examination. The samples were collected from both sexes, different age groups, and body conditions. Age was determined for both sexes based on dentition. Those sheep and goats under one year of age were categorized as young while those greater than or equals to one year were considered as adults (Kumsa et al., 2010). Body condition scoring of the sampled animal was carried out according to the method described by Kripali et al., (2010) and categorized into three scores as poor, medium, and good.

Sampling Methods and Sample Size Determination
Out of 23 PAs of Ada’a district, 3 PAs and Bishoftu town were purposively selected, but the household and study animals were selected by a simple random sampling method. The sample size was determined by the formula described by Thrustfield (2007). Since the study carried out previously in Bishoftu town revealed 85.1% prevalence of GINs in small ruminants, it was taken as expected prevalence. Accordingly, at a 95% confidence interval and 5% precision level the sample size was determined to be 196. Additional 10 samples were taken for precision purpose and a total sample size of 206 was determined.

\[
n = \frac{1.96^2 \times P_{exp} \times (1 - P_{exp})}{d^2} = \frac{1.96^2 \times 0.851 \times (1 - 0.851)}{(0.05)^2} = 196
\]

Where, \(n\) = sample size

- \(P_{exp}\) = minimum expected prevalence = 85.1%
- 1.96 = the value of Z at 95% confidence interval
- \(d\) = desired accuracy level at 95% confidence interval
Study Methodology
Fecal samples were collected from 166 sheep and 40 goats directly from the rectum using disposable examination gloves. From each study animals approximately 10g of fecal samples were collected into universal bottles, clearly labeled with animal identifications and date of collection, then transported using Ice-box to Addis Ababa University College of Veterinary Medicine and Agriculture (AAU-CVMA) Parasitology Laboratory for examination. Those samples which were not examined within 24 hours of arrival at the laboratory were stored in a refrigerator at +4°C and examined the next day early in the morning. The collected samples were subjected to qualitative flotation, coproculture, and identification of the third stage larvae and quantitative McMaster egg counting parasitological techniques using saturated Sodium chloride (specific gravity 1.204) as flotation fluid. The eggs of different parasite species were identified using standard keys given by Soulsby, (1982).

McMaster egg counting was done for samples found positive for strongyle type egg to determine the burden of infestation and performed according to the procedure described by Urquhart et al., (1996). The degree of infestation was categorized based on the number of EPG count. Egg counts from 50-799, 800-1200, and over 1200 EPG were considered as light, moderate, and massive infections respectively (Soulsby, 1986).

Coproculture and L3 Stage Identification
Positive fecal samples for strongyle eggs from animals of the same age group, sex, and species were pooled and cultured for larval identification. Approximately 5 gm of feces from each study animal were pooled for each category and incubated at 27oc for 7 days. The L3 stage was harvested using Baermann technique, placed on a microscope slide then immobilized and stained by Lugol's iodine then identified under a microscope to genus level using identification keys described by Van Wyk et al., (2004). Where possible 100 L3 stages were identified per category if < 100 L3 stage were available then all were identified.

Data Management and Analysis
The raw data were entered into Microsoft Excel spreadsheets, coded, and analyzed using Statistical Package for Social Science (SPSS) version 20 Statistical software. Descriptive statistics were used to quantify the problems and the Chi-square test was used to compare the association between independent variables (sex, age, body condition scores, species, and origin of animals) and the result. The confidence interval was set at 95% and with a 5% degree of precision. A statistically significant association between variables was considered to exist if the computed P-value is less than 0.05.

Results
Overall Prevalence of Gastrointestinal Nematodes in Small Ruminants
Out of 206 small ruminants (166 sheep and 40 goats) fecal samples examined, 126 (61.2%) were found positive for one or more genera of GINs in both species. Specifically, a prevalence of 61.4% and 60% were recorded in sheep and goats respectively. The predominant GINs identified in sheep and goats in the study area were Strongyle type, Strongyloides and Trichuris with a prevalence of 44.2%, 7.3% and 3.9% respectively. Mixed nematode eggs were also examined in some of the samples with a prevalence of 5.8% in both sheep and goats. Specifically, a prevalence of 4.2% in sheep which includes 1.2% (Strongyle + Strongyloides) and 3% (Strongyle + Trichuris) and 12.5% (Strongyle + Strongyloides) in goats were recorded (Table 1).
Prevalence and Associated Risk Factors

Table 1: Prevalence of GIN Genera Identified in Sheep and Goats

A fecal culture of positive samples for strongyle type eggs reveals the presence of Haemonchus (25.2%), Oesophagostomum (11.7%), Trichostrongylus (6.3%) and Bunostomum (1%) in descending order of prevalence. However, Bunostomum and Trichuris genera were not detected in samples from caprines (Table 1).

Risk Factors and Prevalence of GINs

Prevalence of GINs in different PAs of the study area

Considering animal origin (PAs) as a predisposing factor for the prevalence of GINs, samples from Dembi (75%) showed a higher prevalence, whereas samples from Bishoftu town (51.7%) showed the lower prevalence. But, there was no statistically significant difference (P>0.05) (Table 2).

Table 2: Prevalence of GINs with respective categories of animals origin (PAs)

During the study period prevalence was also assessed with respect to predisposing factors. Accordingly, a prevalence of 73.3% and 56.2% in young and adults, 57.5% and 63.2% in males and females were
obtained, respectively. Prevalence according to a body condition score (BCs) were also revealed as 70.6%, 69.7%, and 51.0% in poor, medium, and good body conditioned animals, respectively (Table 2).

### Prevalence of GINs with Respective Categories of Risk Factors

In this study, an evaluation was made to appreciate the variation between species on GINs prevalence. Sheep and goats were found to be infested with a variable degree but without significant variation (p>0.05). Accordingly, the higher prevalence was observed in sheep 102 (61.4%) as compared to goats 24 (60.0%). Similarly, male and female animals were infested with a variable degree of GINs, which showed 42 (57.5%) in males and 84 (63.2%) in females. Higher prevalence was recorded in females than male animals, but the variation was not significant (p>0.05). Based on age groups, the higher prevalence was obtained in the young age group 44 (73.3%) as compared to adult 82 (56.2%) animals and the variation was found statistically Significant (P<0.05). Upon assessment of the prevalence of GINs with respect to body condition scores, the higher prevalence was observed in poor body condition 24 (70.6%) followed by medium 53 (69.7%) and good 49 (51.0%) body conditioned animals with statistically significant difference (P<0.05) (Table 3).

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Categories</th>
<th>No. of Examined</th>
<th>No. of Positive</th>
<th>Prevalence (%)</th>
<th>X²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
<td>Sheep</td>
<td>166</td>
<td>102</td>
<td>61.4%</td>
<td>0.028</td>
<td>0.866</td>
</tr>
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<td></td>
<td>Goat</td>
<td>40</td>
<td>24</td>
<td>60.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Young</td>
<td>60</td>
<td>44</td>
<td>73.3%</td>
<td>5.277</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>146</td>
<td>82</td>
<td>56.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>73</td>
<td>42</td>
<td>57.5%</td>
<td>0.628</td>
<td>0.428</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>133</td>
<td>84</td>
<td>63.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCS</td>
<td>Poor</td>
<td>34</td>
<td>24</td>
<td>70.6%</td>
<td>7.764</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>76</td>
<td>53</td>
<td>69.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>96</td>
<td>49</td>
<td>51.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>206</td>
<td>126</td>
<td>61.2%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3: Prevalence of GINs with respective categories of risk factors**

### 4.3. Burden of Infestation of GINs

A total of 126 fecal samples that were found positive for strongly egg by qualitative simple floatation techniques were subjected to EPG counts using McMaster egg counting techniques. Accordingly, 81 (39.3%), 26 (12.6%), and 19 (9.2%) samples from both sheep and goats were found to be lightly, moderately, and severely infested, respectively (Table 4).
The study revealed that the parasite burden is highly related to the body condition of the animals and the difference was statistically significant (p<0.05). This can be shown by the fact that severely affected animals were high in numbers with poor body condition animals as compared to medium and good body conditioned animals. In this study, the difference in the degree of EPG between young and adult age groups was also detected. Severely infected animals were high in number in the young age group as compared to adult animals and there was a statistically significant difference (P<0.05). Besides, this study revealed that species and sexes had no significant associations with EPG counts (P>0.05), but severely affected animals were higher in numbers in ovine compared to caprines and in female compared to male animals (Table 4).

**Discussion**

Many studies showed that gastrointestinal nematodes are the leading causes of productivity losses in small ruminant production in Ethiopia (Demelash et al., 2006). During this study the coprological examination performed revealed that 126 (61.2%) of examined small ruminants (206) were found positive for at least one GIN parasite. This finding is relatively higher than the researches done by Dagnachew et al., (2011) and Muluneh et al., (2014) who reported the prevalence of 47.67% and 43.2% from North Gondar zone and Dembia district, Northwestern parts of Ethiopia, respectively. But the current finding is lower as compared to the reports of Diriba and Birhanu, (2013); Shankute et al., (2013) and Mideksa et al., (2016) who reported the prevalence of 68.1%, 88.8%, and 86.7% from Asella (Southeast), Bishoftu (Central) and Haramaya town (Southeast), respectively.

The result of this study was also lower than the reports of Dilgasa et al., (2015) from Arsi Negelle (Central Ethiopia) with the prevalence of 69.01%; Zeryehun, (2012) from Haramaya town (South Eastern Ethiopia) with the prevalence of 70.2%; Yimer and Birhan, (2016) from Gonder town (Northern Ethiopia) with the prevalence of 70.8% and Moti, (2008) from Walanchity (Central Ethiopia) with the prevalence of 76.03%. This variation could be due to the difference in agro-ecology of an area of study, a season of study, sample size, flock size, management system, and deworming activities performed in respective areas.

**Table 4: Degree of infestation of GINs with respective categories of risk factors**

The study revealed that the parasite burden is highly related to the body condition of the animals and the difference was statistically significant (p<0.05). This can be shown by the fact that severely affected animals were high in numbers with poor body condition animals as compared to medium and good body conditioned animals. In this study, the difference in the degree of EPG between young and adult age groups was also detected. Severely infected animals were high in number in the young age group as compared to adult animals and there was a statistically significant difference (P<0.05). Besides, this study revealed that species and sexes had no significant associations with EPG counts (P>0.05), but severely affected animals were higher in numbers in ovine compared to caprines and in female compared to male animals (Table 4).

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In this study, higher prevalence of GINs was observed in sheep (61.4%) than in goats (60%) which is in agreement with other findings by Mideksa et al., (2016) who reported 89.2% in sheep and 88.4% in goats and Dugasa, (2010) who reported 85.25% in sheep and 85.05% in goats around Haramaya town. Even though statistically significant difference was not observed, higher prevalence and EPG count of GINs were observed in sheep than in goats. These results agreed with the report of Tigist, (2008) from Bishoftu (Central Ethiopia). This difference is assumed to be due to the grazing habit of the sheep where they graze closer to the ground fostering higher opportunity of exposure to parasites (Dagnachew et al., 2011).

On the other hand, this study disagrees with the reports of Muluneh et al., (2014) who reported prevalence of 41.49% from sheep and 49.2% from goats and Dilgasa et al., (2015) who reported prevalence of 68.4% in sheep and 70.7% in goats, from Dembia (Northwest) and Arsi Negelle (Central) Ethiopia, respectively. Similarly, this finding completely disagrees with the reports of Regassa et al., (2006) who reported 56.6% in sheep and 60% in goat and Abebe and Esayas, (2001) 97.03% in sheep and 100 % in goat from Western and Eastern parts of Ethiopia, respectively. This could be due to higher immune response of sheep to gastrointestinal parasites than goats and the habit of the mixed flock, in which sheep are relatively passive and usually graze/browse from the back of the flock following more alert and voracious mass of goats in the front line that may get access to more feedstuff and parasites as well.

The common GINs identified in the study area were 44.2% Strongyle type, 7.3% Strongyloides, and 3.9% Trichuris, while 5.8% were identified as mixed nematode infections in both sheep and goats. Accordingly, this result agrees with the reports of previous studies conducted in Ethiopia such as 56.6% Strongyle type, 8.2% Strongyloides and 5% Trichuris in Bishoftu by Tigist, (2008); 66.6% Strongyle type and 3.3% Trichuris species in Bedele by Temesgen, (2008) and 70.2% Strongyle type and 4.5% Trichuris species in Western Oromia by Ragassa et al., (2006). Another comparatively very large coproscopic examination report was 97.03% Strongyle type, 45.22% Strongyloides, and 30.25% Trichuris species in the eastern part of Ethiopia by Abebe and Esayas, (2001).

This study revealed that the major GIN infections were with strongyle type among the small ruminants which coincides with the finding of Diriba and Birhanu, (2013) who reported a high proportion of strongyle type infection from Asella (Southeastern Ethiopia). Strongyloides and Trichuris species were poorly represented. This agrees with the idea of Urquhart et al., (1996) which indicates only young animals are more susceptible to these parasites while adults usually develop certain immunity.

The current study has also shown the presence of mixed infection with a prevalence of 5.8% both in sheep and goats. Zeryehun, (2012) also reported an overall prevalence of 1.32% mixed infection in sheep and goats which are lower than the current study. This might be due to the fact that under extensive management, a common practice in the study area, with little or no supplementary feeding, sheep, and goats are exposed to helminth infestation. This condition may lead to poor immune response and this may make the small ruminants readily succumb to GIN infestation (Yohanna et al., 2008).

Based on Coproculture examination the common GIN genera identified in the study area were Haemonchus, Oesophagostomum, Trichostrongylus, and Bunostomum with a prevalence of 25.2%, 11.7%, 6.3%, and 1% respectively, in descending order of prevalence. The prevalence of Haemonchus species was 25.3% in sheep and 25% in goats. This result was lower than the findings of Hailelul, (2002) who reported
61.63% in sheep and 54.76% in goats in and around Wollaita Soddo and Tefera et al., (2011) from Bedelle who reported 69.5% and 65% prevalence in sheep and goats, respectively. The prevalence of Oesophagostomum species was 13.3% in sheep and 4.8% in goats of the study area which is in line with the finding of Bersissa et al., (2011).

In the current study, the prevalence of Trichostrongylus species was 7.2% and 7.5% in sheep and goats, respectively. This result was lower than the reports of Hailelul, (2002) who reported a prevalence of 22.09% in sheep in and around Wolaita Sodo and Esayas, (1988) who reported the prevalence of 16.59 in goats of Ogaden. The prevalence of Strongyloides species during the qualitative fecal examination in the present study was 7.2% in sheep and 7.5% in goats which is lower than the reports of Tefera et al., (2011) from Bedelle who reported the prevalence of Strongyloides species 13.04% and 20% in sheep and goats, respectively.

The prevalence of Bonustomum species was 1.2% in sheep and 0.0% in goats which is extremely lower than the reports of Hailelul, (2002) with the prevalence of 41.86% in sheep in and around Wolaita Sodo; Yoseph, (1993) with the prevalence of 40.48% in sheep in Asella and Tefera et al., (2011) with the prevalence of 26.1% and 35% in sheep and goats in Bedelle, respectively. The differences of the prevalence may be due to agroecology, sample size, management and the current study area have less vegetation and marshy areas which is most favorable for the development and survival of free-living stages of the nematode parasites.

Regarding the association of sex with a prevalence of GIN infection the study revealed that females (63.2%) were more likely to be positive than males (57.5%). However, this variation was not statistically significant (p > 0.05). This result agrees with the finding of Dagnachew et al., (2011) who reported that GINs were more prevalent in females than males. It is assumed that females are more prone to parasitism especially during pregnancy and peri-parturient period due to both stress and decreased immune status (Gauly et al., 2006). However, this result disagrees with the reports of Tefera et al., (2011) and Regassa et al., (2006) which revealed that both sexes have an equal chance to get an infection as both male and female animals are kept under a similar management system.

When the infection rate on age was subjected to analysis, the statistically significant variation was observed between the two age groups (p<0.05). Young (73.3%) animals were more likely to be prone to GINs than adult (56.2%) animals. The result coincides with previous reports by Regassa et al., (2006) and Dagnachew et al., (2011) in Ethiopia and elsewhere by Keyyu et al., (2003) and Fritsche et al., (1993). Age was considered an important risk factor in the prevalence of GINs (Raza et al., 2007). Several authors have documented that adult and old animals develop acquired immunity against helminth infections as they get mature due to repeated exposure (Urquhart et al., 1996 and Dagnachew et al., 2011) in Ethiopia and elsewhere by Keyyu et al., (2003) and Fritsche et al., (1993). Age was considered an important risk factor in the prevalence of GINs (Raza et al., 2007). Several authors have documented that adult and old animals develop acquired immunity against helminth infections as they get mature due to repeated exposure (Urquhart et al., 1996 and Dagnachew et al., 2011) and this will help to expel the parasite before it establishes itself in the GIT (Shah-Fischer and Say 1989). However, this result disagrees with the finding of Emiru et al., (2013) who reported as adult animals are more likely to be prone to GINs than young age groups. The difference might be associated with a long exposure of adults to the communal grazing area and their adaptation to grazing highly than that of young on pasture.

A significant difference (P<0.05) was observed in the prevalence of GINs in relation to body condition score (BCs) such that shedding of nematode eggs was high in animals with poor body condition (70.6%) compared to animals with medium (69.7%) and good (51.0%) body conditions. The high prevalence of
GINs in animals with poor body condition was relatively similar with the finding of Keyyu et al., (2006), Regassa et al., (2006), Tesfaheywet, (2012) and Nigatu, (2008). Animals with poor body condition might be due to malnutrition, other concurrent diseases, or the current parasitic infection which leads to a poor immunological response to the infective stage of the parasite.

Regarding GINs prevalence among the selected study sites, the highest prevalence was recorded in Dembi peasant association (75%) followed by Dalo (63%), Godino (60%), and Bishoftu town (51.7%). However, this variation was not statistically significant (p>0.05). Differences in the level of awareness among the smallholders, availability of communal grazing areas, and accessibility of veterinary services in the respective Peasant associations and Bishoftu town might attribute to the variations of prevalence recorded.

Conclusion and Recommendations
The result of this study clearly shows that most of the small ruminants kept in the study area were infected with gastrointestinal nematodes. This might be a result of the poor management system, the purpose of keeping sheep and goats, lack of veterinary services, poor sanitary conditions, and low level of awareness among the smallholders. The common gastrointestinal nematodes identified in the district were found under the genera of Haemonchus, Oesophagostomum, Strongyloides, Trichostrongylus, Trichuris, and Bunostomum in descending order of prevalence. Body conditions and age of the animals were found the most prominent risk factors influencing the prevalence of GINs. Since mixed crop-livestock farming was practiced in the area farmers give the first line to draught animals and small ruminants are forced to graze behind on overstocked areas. Conclusively, gastrointestinal nematodes were prevalent in sheep and goats in Ada’a district affecting the health and productivity of these animals. Therefore, there is a need for prevention and control programs against these debilitating parasites of sheep and goats in the study areas. Based on the above conclusion the following recommendations were forwarded: Public enlightenment with respect to the management, hygienic practices and deworming of sheep and goats should be intensified for improved production of small ruminants, It is suggested that practice of separate grazing of animals with low stocking rate should be adopted, Proper diagnosis and treatment of sick animals, and deworming of a newly introduced animal to the flock should be practiced and Further studies on the economic importance of nematodiasis and drug resistance patterns of anthelmintics should be conducted for the holistic implementation of nematodes control.

References


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