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Prevalence of Ovine Lungworm in Demot Woide Woreda.

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Abstract

A cross-sectional study was conducted from September, 2016 to April, 2017 to estimate the prevalence of ovine lungworms infection and to investigate some of the risk factors associated with it in Damot Woide Woreda, Southern Ethiopia. Faecal samples were collected from randomly selected 384 sheep (196 Female and 188 Male) to estimate first stage larvae (L1) using modified Barman technique. The overall prevalence ovine lungworms infection recorded by faecal examination was 49(12.76%). *Dictyocaulus filaria, Protostrongylus rufescens,* and *Mullerius capillaries* were identified. *Dictyocaulus filaria* was the most prevalent species found in the study area accounting 18(4.68%) of total positive sheep. The prevalence rate of ovine lungworms infection between male and female sheep was 22(11.70%) and 27(13.77%) respectively. Regarding to the age, the highest prevalence 17(17.70%) was observed in sheep with less one years of age while the lowest prevalence 8(9.19%) was observed in sheep of greater than three years of age. The prevalence of lungworm infection in the sheep between extensive and semi-intensive management system in which the prevalence rate accounts 39(19.69%) and 10(5.37%) respectively. According to the body condition, highest prevalence 30(24.19%) was in poor body condition and lowest prevalence 4(7.27%) in good body condition. Thus lungworm infection is an important parasitic disease in Damot Woide Woreda and further investigation is warranted to assess its impact on economy and to reduce its incidence.

Keywords: Damot Woide, Infection, Lungworm, Prevalence, Woreda.

Introduction

Sheep play an important role in the socio-economic development of the majority of African countries. They supply more than 30% of domestic meat consumption and generate cash income from export of meat, mainly as live animals and skin and it also provides wool, milk, manures for the soil and serves as investment for the farmers. Hence an increase in sheep production and also to increase export earnings, however, several factors especially constrains their full utilization. Among these diseases, respiratory diseases have been identified as an important problem of sheep in the highlands of Ethiopia for the last two to three decades. It may account for up to 54% of the overall mortality of in central highlands of Ethiopia (Zelalem, 2005).

Helminthes parasites of ruminants are the most prevalent, with many tropical and sub-tropicalenvironments of the world providing nearly perfect conditions for their survival and development. However, the clinical signs they cause in infected animals can be less obvious than signs of other livestock diseases partly for this reason, infections with gastro-intestinal and other helminthes parasites are among the most neglected areas of veterinary in much of the developing world. It has however been established that high prevalence rates of infection with sign associated with poor production and unthriftness (Radostitis *et al.*, 2006).

Among the respiratory diseases endoparasites such as*dictyocaulidae* and/or certain *metastrongylidae* are known to exist in east Africa (Ethiopia, Kenya and Tanzania) and South Africa (Alemu *et al.*, 2006). Endoparasites including *Dictyocaulus filaria*, are major causes of death and morbidity on farms in Ethiopian highlands. The production losses due to helminthes is associated with direct direct consequences of clinical and sub-clinical infections resulting in low productivity due to stunted growth, reduce weight gain, poor feed utilization or loss due to mortality or indirect loss associated with cost of treatment and control measures (Desalegn, 2003).
Control of these parasites is therefore, essential for releasing the potentials of sheep production. For the proper control to be knowledge of parasitic diseases and their dynamics must dangerous to lay down rigid rules of their control which are applicable for all regions. For these reasons a study of epidemiology of each parasitic disease should limited small areas (Radostitis *et al*., 2006).

Therefore, to increase the potential of sheep production and to get the maximum benefits from them prevention and control of lungworm is very important. Although environmental factors are conductive for lungworm infections in sheep in some parts of Damot Woide Woreda and lungworm infection is considered as an important disease in this Woreda.

Therefore, the objectives of this study were;

- To determine prevalence of ovine lungworms infection in Damot Woide Woreda.

To investigate some of the risk factors associated with it.

Materials and Methods

Study area

Damot Woide Woreda has a total area of 26,550 hector and lies with an elevation ranging from 1600-1800 meters above sea level. The woreda has 23 peasant associations with a total population of 125,812 (DWWANRD, 2018). It was located about 406 km from Addis Ababa and 26km from the Soddo, Wolaita Zone capital city. Regarding the agro-ecology of the woreda out of the total land size 35% is lowland and 65% midland. The annual mean temperature 17.6-25^{o}c and the annual mean rain fall ranges 1100-1500mm. According to the land utilization data of the region, 8,403 hector is cultivated land, 4,380 hector grazing land, 2,229.5 hector forest, 969.83 hector bushes and shrub land. The livestock population was Cattle (165,879), Sheep (85,841), Goats (95,478), Equine (7,943) and Poultry (105,171) (DWWLFD, 2018).

Study population

The study populations were sheep in Damot Woide Woreda. Sheep in the study are kept under extensive and semi-intensive management system. These sheep are maintained in small household flocks of mixed age group and sex for subsistence and small scale private farm for sale.

Study design

The study was cross-sectional study carried out to determine the prevalence of ovine lungworm infection and to investigate some of the risk factors associated with it in Damot Woide Woreda. A total proportion of 384 sheep obtained from selected sites of Damot Woide Woreda. The variable of interest considered as an output variable versus risk factors during the study was faecal samples for larvae of lung worm. The risk factors considered were the age, sex, management and body condition score.

Sample size determination

The size required for this study was determined based on sample size determination in random sampling for infinitive using expected prevalence of sheep lungworms at 5% desire absolute precision according to (Thrusfield, 2005) as follows:

$$N = \frac{1.96 \times Pexp\ (1-Pexp)}{d^2}$$

Where,

N = required sample size
Pexp = expected prevalence
d = desired absolute precision

Since there was no similar work done in the area previously, expected prevalence was taken as 50% and the confidence interval was chosen as 95% and desired precision was 5%. By substituting these values in the formula, the sample size was 384.

Sampling Procedure

Samples were collected from sheep occasionally from visits to field. In any case sheep were selected

randomly. Faecal samples were collected directly from rectum of all selected sheep and stored in vials until examination. During the collection of the faecal samples, the following data are recorded; age, sex, management system, and body condition score. Sampled sheep were categorized in to three age groups as group I = <1 years, group II = 1-3 years and group III = >3 years of age. Age of study sheep were determined based on owner's information and dental estimation methods and body condition score as good, medium and poor (Alemu, 2008).

In the laboratory, five grams of fresh feaces was weighted from each sheep. It was wrapped with gauze, fixed on to string in a beaker filled with water. The modified Baerman apparatus was left for 24 hours. The larvae in the feaces migrate to the gauze and settle at the bottom of the glass. After siphoning off the supernatant, the sediment was examined under low power of the microscope as stated by (Charles, 2006).

Identification and characterization

In the laboratory following conventional methods of Baerman technique was used for the identification of lungworm larvae. Five grams of fresh faeces was weighted from each sample for the extraction of L1 larvae and enclosed in gauze fixed on to string rode and submerged in a clean glass tube filled with slightly warm water. The whole apparatus was left for 24 hours and then the sediment was examined under low power of the microscope after siphoning of the supernatant. When positive, a drop of 1% iodine solution was used to immobilize the larvae for the identification of the species, otherwise it was registered negative for lungworm infections (Urquhart *et al.*, 1996).

During identification the larvae, the presence of *D. filaria* was confirmed by the finding of the first stage larvae with the anterior protoplasmic knob and black granular intestinal inclusions. The larvae of *P. rufescens* and *M. capillaris* are differentiated by their characteristic features at the tip of the tail. *P. rufescens* has a wavy outline at the tip of its tail, but devoid of dorsal spine. On the other hand *M. capillaris* has undulating tip and dorsal spine (Schneider, 2000).

Data management and analysis

Data was entered and managed in Microsoft excel work sheet and analyzed using statistical software programs (SPSS version 16.0). Prevalence of lungworm at sheep was expressed as percentage with 95% confidence interval (CI) by dividing the total number of animals positive to the lungworms to the total number of animals examined. A was considered positive for for lungworm if it was positive for faecal examination. The significance of differences between the prevalence of lungworms was determined using chi square test. The explanatory variables (sex, age, management and body condition score) were considered as risk factors to see their association with the level of prevalence.

Results

Coproscopic examination

A total of 384 sheep faecal samples were examined by modified Baerman technique, out of the examined sheep 49 were found to be with one or more of lungworm species with an overall prevalence of 12.76% (49/384). The lungworm species encountered during the study period were *Dictyocaulus filaria*, *Mullerius capillaris* and *Protostrongylus rufescens* which accounted for the prevalence of 4.68%, 3.12%, and 2.6% respectively. The prevalence of mixed infection was 2.34% in which *Dictyocaulus filaria* (4.68%) was the most prevalent species of lungworm in the study area (Table 1).

Table 1: prevalence of lungworm species

Lungworm species	Positive	Prevalence (%)
Dictyocaulus filarial	18	4.68
Protostrongylus rufescens	12	3.12
Mullerius capillaries	10	2.6
Mixed infection	9	2.34
Total	**49**	**12.76**

Prevalence of lungworm infection based on age

Sheep were categorized in to three age groups as Group I = <1 years of age, Group II = 1-3 years of age and Group III = above three years of age. Among the 384 sheep, the highest prevalence (17.70%) was observed in age of less than year's sheep while the lowest prevalence (9.19%) was observed in sheep less than above 3 year of age (Table 2).

Table 2: prevalence of lungworm infection in sheep based on age

Age	No. of Examined	*DF(%)*	*MC(%)*	*PR(%)*	*MI(%)*	Prevalence (%)
<1 Year	96	8 (8.33)	3(3.12)	4(4.16)	2(2.08)	17(17.70)
1-3 Year	201	7(3.48)	6(2.98)	6(2.98)	5(2.48)	24(11.94)
>3 Year	87	3(3.45)	1(1.15)	2(2.29)	2(2.29)	8(9.19)
TOTAL	**384**	**18(4.68)**	**10(2.6)**	**12(3.12)**	**9(2.34)**	**49(12.76)**

DF=Dictyocaulus filaria,MC=Mullerius capillaris,PR=Protostrongylus rufescens,MI=Mixed infection

Prevalence of lungworm infection based on sex

As the study was made on lungworm infections in the relation to the sex of sheep and accounted for a prevalence rate of 11.70% in males and 13.77% in females (Table 3).

Table 3: prevalence of lungworm infection based on sex

Sex	No. of Examined	*DF*(%)	*MC*(%)	*PR*(%)	*MI*(%)	Prevalence
Male	188	6(3.19)	3(1.59)	10(5.31)	3(1.59)	22(11.70)
Female	196	12(6.12)	7(3.57)	2(5.32)	6(3.06)	27(13.77)
Total	**384**	**18(4.68)**	**10(2.6)**	**12(3.12)**	**9(2.34)**	**49(12.76)**

DF= Dictyocaulus filaria,MC=Mullerius capillaries,PR=rotostrongylus rufescens,MI=Mixed infection

Prevalence of lungworm infection based on management

The study was conducted by categorizing sheep in to two groups as extensive and semi-intensive management system. There was prevalence of lungworm infection between two different management system in which the prevalence was high (19.69%) in sheep maintained under extensive management system than (5.37%) semi-intensive management system (table 4).

Table 4: prevalence of lungworm infection based on management (Mgt)

Mgt	Examined	*DF*(%)	*MC*(%)	*PR*(%)	*MI*(%)	Prevalence (%)
Extensive	198	15(7.57)	8(4.04)	10(5.05)	6(3.03)	39(19.69)
Semi-intensive	186	3(1.61)	2(1.07)	2(1.07)	3(1.61)	10(5.37)
Total	**384**	**28(4.68)**	**10(2.6)**	**12(3.12)**	**9(2.34)**	**49(12.76)**

DF=Dictyocaulus filaria,MC=Mullerius capillaris,PR=Protostrongylus rufescens,MI=Mixed infection

Prevalence of lungworm infection based on body condition

The study was conducted to see the influences of body condition on the prevalence of lungworm infection between the prevalence of lungworm and body condition of the sheep with a prevalence rate of 24.19%, 7.32% and 7.27% in poor, medium and body condition, respectively (Table 5).

Table 5: prevalence of lungworm infection in different body condition

BCS	No.of Examined	***DF* (%)**	***MC* (%)**	***PR* (%)**	***MI* (%)**	Prevalence (%)
Poor	124	11(8.87)	6(4.84)	8 (6.45)	5(4.03)	30(24.19)
Medium	205	5(2.44)	3(1.46)	3(1.46)	4(1.95)	15(7.32)
Good	55	2(3.63)	1(1.81)	1(1.81)	0	4(7.27)
TOTAL	**384**	**18(4.68)**	**10(2.6)**	**12(3.12)**	**9(2.34)**	**49(12.76)**

DF=Dictyocaulus filaria,MC=Mulleriuscapillaris,PR=Protostrongylusrufescens,MI=Mixed infection

Discussion

This cross-sectional study revealed that the presences of three lungworm species affecting the respiratory tract of sheep with an overall prevalence rate of 12.76% in Damot Woide woreda, Southern Ethiopia. This finding agrees with the reports of 13.24% in and around Mekele (Frewengel, 1995). On the other hand, the 12.76% prevalence rate observed in this study is lower than 34.90% by Beyene *et al* (2013) in Ambo and 28.6% by Gabreyohannes *et al* (2013) in Mekedella Woreda.

The differences in the prevalence of lungworms of sheep in the above study might be associated with the differences in the methods followed for the detection of larvae of lungworms and the study area which favors the survival of the larvae of lungworm or it may be due to nutritional status of the animals in the respective study areas which can influence the prevalence harboring the intermediate host, management practice of animals, rainfall, humidity and temperature differences and season of the examination on the respective study area. The reason for the low prevalence of the disease in this study could be attributed to the establishment of open air clinic, increasing number of private veterinary pharmacy, and increase awareness of farmers to deworm their sheep.

With regard to age, the high prevalence (17.70%) was observed in sheep of less than one years of age followed by the prevalence observed in sheep of 1-3 years of ages, while the low prevalence (9.19%) in sheep of greater than three years of ages. This is study was agree with Beyene *et al* (2013). This may be associated with the apparent inability of the host to develop acquired immunity so that the young animals have the highest infection and the highest prevalence of lugworms in study area.

In the current study higher level of prevalence was observed in female (13.77%) sheep compared to the level of prevalence in male sheep (11.70%). The result was consistent with Denbarga *et al* (2013) who report that that there was a significant variation in the infection rate of lungworms in male and females. The difference of prevalence between male and female animals may associated with the fact that resistance to infection is abrogated at the time of parturition and early lactation which results in the females inability to expel adult worms and causes higher level of larvae detection (Craig, 1998). The way that males and females treated in the terms of nutrition may also attribute for such differences. Males are kept for fattening to be sold later, except some which are kept for breeding, receives more attention by sheep producers. Crop left over and ruminants after human consumption, for instance, are provided primarily for male animals (Alemu *et al.*, 2006).

In the current study, species of lungworms of sheep were tried to be identified via coprological examinations. Dictyocaulus filaria was isolated more frequently followed by Protostrongylus rufescens while Mullerius capillaris was the latest identified species of lungworms. This is study was agree with Beyene *et al* (2013) in Ambo district. This difference in the prevalence of the different species of lungworm might be associated with the difference is in their life cycles. *Dictyocaulus filaria* has direct life cycle; takes less time to reach the infective stage and the larvae can appear in the feaces with in five weeks after ingestion. The tranismission of *Protostrongylus rufescens* and *Mullerius capillaris*is complex involving host, parasite, intermediate host and climate. Furthermore, development from first stage to infective stage larvae in the snail takes 12 to 14 days. Therefore the probability of infection, transmisstion and re-infection takes longer time compared with *Dictyocaulus filaria* and causes for the lower frequency of infection in these parasites (Urquhart *et al*., 1996).

In the present study, different level of prevalence were observed in sheep which have poor body condition (24.19%), medium body condition (7.32%) and in sheep of good body condition (7.27%). This study was agrees with Beyene *et al* (2013) in Ambo district. This signifies that poor body condition animals are more susceptible to an infection. The reason for this partly due to the fact that poorly nourished animals appear to be less competent in getting ride- off lungworm infection.

In the present study, the level of prevalence was compared between sheep kept under extensive and semi-intensive management systems. The prevalence was higher (19.69%) in sheep kept under extensive system of management, and the study was agrees with Denberga *et al* (2013). The possible reason for the current findings could be increased the degree of pasture contamination in extensive system of management which increases the degree of exposure (Kahn, 2005). Furthermore, the response of lungworm infection varies widely depending on the nutritional status, age, age of host, and the number of larvae ingested (Alemu *et al.,* 2005).

Conclusion and Recommendation

The study on prevalence of lungworm infection of sheep by faecal examination in Damot Woide Woreda with the overall prevalence during the study period was 49(12.76%). The respiratory nematodes identified during the study period were *Dictyocaulus flaria, Mullerius capillaries* and *Protostrongylus rufescens*. This high prevalence of verminous pneumonia as the result of this three species is considered as one the important nematodes infection of sheep in the study area. In the study, the infection prevalence of lungworm has significant association with age of sheep, management system, sex and body condition have great contribution to the prevalence of lungworm infection in the study area. Coproscopic examination confirms the existence of lungworm infection in Damot woide woreda.

Therefore, based on the present findings, the following recommendations are forwarded;

- ❖ Regular strategic deworming of the whole flock of sheep with broad spectrum antihelimentics should be undertaken.
- ❖ Sheep should not be allowed to have access to moist and swampy area.
- ❖ Additional shed should be provided to sheep to make well nourished and good body condition.
- ❖ Farmers who keep sheep should advise not to keep their sheep in extensive management system.
- ❖ In the rainy weather conditions intermediate host such as snails and slugs become active. During this season farmers should be prohibition of sheep to graze early in the morning and evening.

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