

Ovine Lungworm Infection: Prevalence, Species Composition and Associated Risk Factors in Dessie Zuria District, Northeastern Ethiopia

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Abstract: A cross-sectional study was conducted between October and December 2011 to determine the prevalence and species composition of lungworms and evaluate the effect of associated risk factors in sheep in Dessie Zuria district, northeastern Ethiopia. A total of 390 sheep faecal samples were collected and examined to detect first stage larvae (L₁) of lungworms using a modified Baermann technique. The overall prevalence of lungworm infection was 43.33% (169/390). *Muellerius capillaris*, *Dictyocaulus filaria* and *Protostrongylus rufescens* were identified as single and mixed infections. The proportions of infection by *M. capillaris*, *D. filaria* *P. rufescens* and mixed infection were 26.15, 10.51, 4.61 and 2.05%, respectively. Mixed infections were formed among *M. capillaris* and *D. filaria*. Age-wise infection rate was 50.00 and 36.31% in adults and young animals, respectively with significant difference ($P < 0.05$) between them. A significant difference ($P < 0.05$) was also observed in the infection rate between male (36.81%) and female (49.03%) animals. The infection prevalence in the highland (48.43%) was significantly higher ($P < 0.05$) than midland (38.38%) areas. The result of this study indicated that lungworms in sheep are common parasites which induce heavy economic loss that needs greater attention.

Key words: Baermann Technique • Dessie Zuria • Ethiopia • Lungworms • Prevalence

INTRODUCTION

In Ethiopia, sheep are the dominant livestock providing up to 63% of cash income and 23% of food substance value obtained from livestock production. Despite these, the contribution of this subsector to the nation's economy is still very low. Endoparasitic infection and management problems are known to be the main factors that affect productivity. The various species of gastrointestinal and pulmonary nematodes, trematodes and cestodes are known to be prevalent in Ethiopia [1].

Lung nematodes are frequently found in sheep and it is an important problem for sheep breeders throughout the world. These parasites cause respiratory problems such as bronchopneumonia and death in young and to the economic losses, reduced weight gain, retarded growth and decreased milk production [2].

Vermineous pneumonia of sheep and goats are most commonly caused by infection with *D. filarial*, *M. capillaris* and *P. rufescens*. Lungworms species like *Dictyocailus viviparous* and *D. arnfieldi* affect cattle

and equines, respectively [3]. Different lungworm species are reported in sheep from different parts of Ethiopia, however, data on the lungworm infections with respect to prevalence and species composition is lacking in the study area. The objective of this study was to identify the lungworm species and determine their prevalence in sheep.

MATERIALS AND METHODS

Study Area: A cross-sectional study was carried out between September and December 2011 in two selected sites representing highland and midland areas of Dessie Zuria district, northeastern Ethiopia to identify lungworm species and determine their prevalence. The altitude of the district is 1700-3800 meters above sea level. The annual rainfall ranges from 1100-1200 mm and the average temperature is between 15°-28°C. It is covered with 45% highland, 47% midland and 8% lowland areas. The livestock population of the district is comprised of 109570 cattle, 164371 sheep, 58493 goats, 31058 equines and 115102 poultry [4].

Study Animals: The study animals included 390 indigenous sheep breeds from two agro-ecological areas (highland and midland) that have been kept under traditional extensive management system. They were of different age groups and both sexes. The age of animals was estimated by stage of dentition [5]. Based on this, animals were categorized into 2 age groups as young (< 1 year old) and adult (>1 year old).

Sample Collection and Examination Procedures:

Fresh fecal samples were collected from 390 sheep per rectum and placed in sampling bottles and transported to the Kombolcha regional veterinary laboratory. During fecal sample collection, date, owner’s name, site, species, sex and age of animals were properly recorded. In the laboratory, fresh faeces were subjected to coprological examination for the detection of L1 larvae using the modified Baermann techniques [6]. About 10 grams of faeces were enclosed in double layered gauze suspended and fixed in a beaker containing water by using a string rod. The whole apparatus was stayed for about four hours and then the sediment was examined under the low power microscope (10x). When positive, a drop of 1% iodine solution was used to immobilize the larvae for identification of species of lungworm larvae. Larvae were identified based on morphological characteristics [2, 7]. *D. filaria*, L1 has a characteristic cuticular knob at the anterior extremity and dark granulation of the intestinal

cells. While the others ovine lungworms are devoid of anterior protoplasmic knob. *P. rufescens* has a wavy outline at the top of its tail and *M. capillaries* have an undulating tip and a dorsal spine.

Data Analysis: The collected data was entered into Ms-excel spread sheet program to create a database and transferred to the statistical package for social sciences (SPSS) software version 17.0 program for analysis. Chi-square was employed to determine infection rate between risk factors. Differences between parameters were tested for significance at probability levels of 0.05 or less.

RESULTS

Out of a total of 390 sheep examined over the study period, 169 (43.33%) were positive for lungworm infections. First stage larvae of *M. capillaris* (26.15%), *D. filaria* (10.51%) and *P. rufescens* (4.61%) were observed as single and mixed infections. Mixed infections were formed between *D. filaria* and *M. capillaries* in 2.05% of sheep (Table 1). There was a significant variation (P<0.05) in the infection rate among the various study sites. The higher prevalence was recorded in areas with high altitude (48.43%) than midland (38.38%) (Table 2). Age-wise lungworm infection rate was significantly higher (P<0.05) in adult sheep (50%) as compared to younger

Table 1: Prevalence of lungworms based on the species of the parasite in the study area

Species of lungworms	No. positive animals	Prevalence (%)
<i>D. filarial</i>	41	10.51
<i>M. capillaries</i>	102	26.15
<i>P. rufescens</i>	18	4.61
Mixed (<i>M. capillaris</i> & <i>D. filaria</i>)	8	2.05
Total	169	43.33

Table 2: Prevalence of lungworms based on study sites (altitudes)

Site	No. animals examined	No. positives	Prevalence (%)	χ^2	P-value
Highland	192	93	48.43	4.012	0.045
Midland	198	76	38.38		
Total	390	169	43.33		

Table 3: Prevalence of lungworms based on age and sex categories

Age and sex	No. animals examined	No. positives	Prevalence (%)	χ^2	P-value
Age					
Young(<1 year)	190	69	36.31	7.43	0.006
Adult (> 1 year)	200	100	50		
Sex					
Male	182	67	36.81	5.933	0.015
Female	208	102	49.03		

ones (36.31%). The prevalence of lungworm infection observed in male animals was 36.81% while in females 49.03%. There was a statistically significant difference ($P < 0.05$) between the two sexes (Table 3).

DISCUSSION

The present study revealed the presence of *M. capillaries*, *D. filaria* and *P. rufescens* as major respiratory nematodes of sheep in the study area with an overall infection rate of 43.33%. This finding is closely agrees with previous study done by Regassa *et al.* [8] with a prevalence of 40.4% in Dessie and Kombolcha districts, northeastern Ethiopia. But lower than reports of Alemu, *et al.* [9] in northeast Ethiopia and Bekele and Abu [10] in Tiyo District, South-East Ethiopia with a prevalence of 53.6 and 57.1%, respectively. However, it is higher than that of Addis *et al.* [11] and Weldesenbet and Mohamed (12) with 33.83% prevalence at Gondar and 26.7% at Jimma, respectively. These differences might be due to the method used for the detection of the larvae, or difference in the study area of topography, which has conducive environment for the survival of larvae and intermediate hosts, slug or snails and also the nutritional status of sheep in respective study area which can influence the larvae of immunity to be infested by lungworm.

With regard to the species of lungworms, it was observed that *M. capillaries* were the predominant species in the study area followed by *D. filaria* and *P. rufescens*. This finding is supported by Sissay [13] in Bahirdar and Mezgebu [14] in Addis Ababa. In contrast to the present findings, Alemu *et al.* [9] reported that *D. filaria* was the most prevalent in their survey. The possible explanation for the predominance of *M. capillaris* in the study area might be attributed to the presence of favourable environmental conditions for the breeding and development of the snail intermediate hosts and the parasite. The proportion of infection in sheep by *M. capillaris* (26.15%) was in agreement with reports of Regassa *et al.* [8] with 28.3% but differs by *D. filaria* and mixed infections with 1.3% and 10.8%, respectively.

A higher prevalence of *D. filaria* and *M. capillaris* has been reported as the major causes of lungworm infection in indigenous breeds of sheep in the Ethiopian highlands. Ayalew [15] observed a high proportion (80.0%) of *D. filaria* recovery in post-mortem examination of 24 sheep from Ethiopian highlands. Bekele *et al.* [16] noted 53% prevalence from the highlands of Wello (northern Ethiopia) and Arsi (southern Ethiopia). In

another study, 30.9 and 6.7% infection prevalence due to *M. capillaris* and *D. filaria*, respectively, were recorded from North Shoa, central Ethiopia [17]. These variations in morbidity may be due to the differences in climate, husbandry practice and access to health services and genetic resistance of breeds.

In the present study, highest prevalence (50.00%) was observed in adult sheep than young (36.31%). This finding is not in accordance with Bekele and Abu [10] who reported that young sheep were found to harbour as many lungworms as compared with adult sheep. This might be associated with the apparent mobility of the host to develop acquired immunity, so the adult animals have the heaviest infection and the highest prevalence [7].

In the current study, higher level of prevalence was observed in female animals (49.03%) compared to males (36.81%). The result is in agreement with previous study done by Alemu *et al.* [9]. This difference in prevalence between female and male animal could be due to the fact that the resistance to infection is abrogated at the time of parturition and during early lactation. This periparturient relaxation of resistance results in the female's inability to expel adult worms [18] which cause higher level of larval detection.

In the present study the prevalence of lungworm infection was seen to increase with altitude. This result is in agreement with the report of Alemu *et al.* [9]. This might be due to the effect of altitude is attributable to climatic parameters. That is the survival and development of lungworm larvae is favoured by low moisture content and high humidity [7].

From the results of this study, it can be concluded that the infections caused by lungworms are significantly common in the study area and are important health problems of sheep which is speculated to cause heavy economic loss. Emphasis should be given towards improving the overall health and nutritional conditions of animals.

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