Ovine Lung Worm Infection and Associated Risk Factors in and Around Wukro, Eastern Tigray, Ethiopia

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Abstract: A cross sectional study was conducted in and around wukro to determine the prevalence of ovine lungworm infections and associated risk factors. Out of 320 fecal samples 42 were found to be positive for lungworm infection using modified Berman technique for identification of first stage larvae (L1). The overall prevalence of lungworm infections in the study area was 13.1%. There was a statistical significant difference (p<0.05) in the prevalence of lung worm infection with regard to sex, age and body condition as well as sheep with detected respiratory clinical signs. In the current study, it was found that female sheep were 31.0% more likely to be infected with lung worm than male sheep. Sheep with <1 year of age and 1-3 years were 3.04 times and 30.0% more likely to be infected with lungworm infection than sheep in the age group > 3 years old respectively. Sheep with poor body condition and medium body conditions were 14.90 and 3.30 times more likely to have lungworm infection compared to sheep with good body conditions respectively. Moreover, the odds of sheep that showed clinical signs had 7.59 times higher chance of infection with lungworm compared to sheep with no clinical signs. Hence, sex, age, body condition and clinical signs were found to be the major risk factors associated with ovine lungworm infection. Due to its impact on sheep production of the area, due emphasis should be given for the control and prevention of lungworm infection.

Key words: Berman Technique • Lungworm • Ovine • Prevalence • Risk Factors • Wukro

INTRODUCTION

Ethiopia is a country with different agro-ecological zones where considerable populations of small ruminants are raised. The small ruminant population of Ethiopia is estimated to be nearly 23 million goats and 23.62 million sheep [1]. Of the total sheep population, 75% are raised in highlands with altitudes above 1,500 meter above sea level. Small ruminants are important contributors to food production in Ethiopia, providing 33% of meat consumption and 14% of milk consumption, 40% of fresh skins and 92% of the value of semi - processed skin and hide export trade. It is estimated that 1,078,000 sheep and 1,128,000 goats are used in Ethiopia for domestic consumption annually [2].

Unlike the large potential of small ruminants in the country, their productivity is low. Endo-parasitic infection is known to be the main factors that affect productivity. Helminth parasites are among the causes of substantial productivity losses in ovine production of the country. Respiratory diseases resulting from helminth parasites are of a great economic concern in sheep production in the highlands of Ethiopia where sheep are important livestock units [3-5].

Sheep Lungworm disease are one of the major respiratory disease that widely distributed throughout the world but are particularly common in countries with temperate climate and in the high land of tropical and sub-tropical countries of the world providing nearly perfect condition for their survival and development. The pathogenic effect of lungworms depends on their location within the respiratory tract, the number of infective larvae ingested and the immune system of the animals [6]. Endo parasites, including *D. filaria*, can suppress immunity of the respiratory tract and causes death, poor weight gain or loss of body weight as well as greatly affects the potential productivity of sheep industry in the areas where it is prevalent [7].

Lungworm infection in sheep is caused by nematode species such as *Dictyacaulus filaria*, *Muellerius capillaries* and *Protostrongylus rufescens* [8]. These nematode parasites belong to two super family,
Trichostrongyloidea (D. filaria) and Metastrongyloidea (P. rufescens and M. capillaries). Protostrongylidae species occur in the alveoli, bronchioles and parenchyma of the lungs of various species of mammals. Dictyocaulidae species are located in respiratory passages of the lungs [9]. Dictyacaulus filaria has a direct life cycle whereas M. capillaries and P. rufescens have indirect life cycles. Dictyacaulus filaria infection is acquired by ingestion of infective larvae with herbage but M. capillaris and P. rufescens are transmitted when Molluscan intermediate hosts are accidentally ingested by grazing animals. Dictyacaulus filaria is the most important lungworm of sheep and goats and commonly associated with a chronic syndrome of coughing and unthriftiness, which usually affects lambs and kids. Muellerius capillaris and P. rufescens are more common but less pathogenic when compared to D. filaria [8].

In Ethiopia, although fragment studies have been done and reports are available, however, little information has been documented on the status of ovine lungworm infection. Moreover, in the study area little information has been documented on the associated risk factors of the disease in ovine. Therefore, this study was aimed to determine the prevalence of lungworm infection in sheep population and identify risk factors and quantify their degree of association with the disease in the study area.

MATERIALS AND METHODS

Study Area: Wukro district is located at a distance of 858 Km from capital city Addis Ababa and 43 Km from regional city, Mekelle, at altitude of 13°47'N' and a longitude of 39°36'E'. It is situated in an elevation of 1977 meter above sea level. The mean annual rainfall and temperature of the study area are 300-350mm and 11.1-28.3°C respectively [1].

Study Design and Sampling Method: A cross-sectional study was conducted to determine the prevalence of lungworm infection and assess effect of major host related risk factors on the occurrence of these parasites in sheep and simple random sampling technique was utilized to select the sheep from around Wukro Town.

Sample Size Determination: The desired sample size for the study was calculated using the formula given by Thrusfield [10] with 95% confidence interval and at 5% precision. Considering the previous prevalence of 13.4% of ovine lungworm infection in and around Mekelle reported by Ibrahim and Degefa [5] and 5% absolute precision, the sample size was calculated to be 178. However, in order to increase the level of accuracy, the numbers of sampled sheep were 320.

Data collection and Parasitological Examination: Fresh fecal samples were collected directly from the rectum of individual sheep and the samples were placed in a universal bottle and packed in an icebox. The sex, age, body condition and code of sampling were recorded while taking the sample. The sample was then transported to the Mekelle University, College of Veterinary Medicine Laboratory. In the laboratory, fresh feces were subjected to coprological examination for the detection of larvae (L1) using Modified Baermann Techniques [11]. About 10 grams of feces 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 24 hours and then the sediment was examined under compound microscope. All larvae were identified based on morphological characteristics [12, 13].

Data Analysis: The MS-excel spread sheet program was employed to create dataset and STATA software version 11.0 was used to analyze the data. Descriptive statistics was used to summarize the data. Univariate logistic regression analysis was conducted to quantify the degree of association between the risk factors and prevalence of lungworm and expressed as odds ratio (OR) and 95% confidence interval. P-value of 0.05 was regarded as a cut-off point for statistically significant difference for all analysis.

RESULTS

Out of the total 320 fecal sample examined using a Modified Baerman technique 42 were positive for lungworm infection, revealing an overall prevalence of 13.1% of ovine lungworm infection in the study area (Table 1).

In the current study a statistical significance difference (p<0.05) in the prevalence of ovine lungworm infection were observed among the different age groups, sexes, body condition scores and clinical examination. Higher prevalence was recorded in female sheep (15.1%) compared to males (12.0%). Female sheep were 31.0% more likely to be infected with lung worm than male ones (OR=1.31, 95% CI= 0.674, 2.545) (Table 2).
Comparatively the prevalence of lungworm infection among different age groups showed relatively higher in age groups less than 1 years old (25.0%) and lowest in age groups of greater than 3 years old (9.7%). Sheep in the age group of <1 year’s old and 1-3 years were 3.04 times and 30.0% more likely to be infected with lungworm than sheep in the age category of > 3 years old (OR=3.04, 95% CI = 1.408, 6.544) and (OR=1.30, 95% CI= 0.559, 3.025) respectively (Table 2). Based on body condition, animals were categorized into three groups; poor, medium and good. Accordingly, prevalence of 39.5%, 12.6% and 4.2% were recorded in sheep with poor, medium and good body conditions respectively. Sheep with poor body conditions were 14.90 times more likely to have lungworm infection compared to sheep with good body (OR=14.90, 95% CI = 5.040, 44.087) (Table 2).

A prevalence of 32.5% of lungworm infection was found in sheep with respiratory sign and only 5.9% of the disease was found in apparently healthy sheep. The Odds of sheep with respiratory clinical sign were 7.59 times more likely to have lungworm infection compared to apparently healthy sheep (OR=7.59, 95%; CI= 3.753, 15.334) (Table 2).

**DISCUSSION**

The present study revealed that the overall prevalence of lung worm infection in sheep in the study area was 13.1%. The present study is in line with the finding by Ibrahim and Degefa [5] reported a prevalence of 13.4% in Mekelle city and a prevalence of 16.9% was found in and around Debre birhan by Yekitie [14]. However, in the current study less prevalence of lung worm infection was obtained when compared with the previous researchers report. Tigist [15] reported a prevalence of 39.6% in North and South Gondar zone, a prevalence of 40.4% was reported in Dessie and Kombolchea districts, Northern Ethiopia by Regassa et al. [16] and a prevalence of 53.6% was found in Northwestern Ethiopia by Alemu and Merkel [2].

The possible explanation for variation in prevalence of ovine lung worm infection might be due to the differences in agro-ecology of the study areas which favor or disfavor the survival of parasites larvae, season, altitude, rainfall, humidity and temperature difference and management practices or it might be due to the nutritional status of the animals which can affect the level of immunity of animals being affected by lung worm [8, 12, 17]. Moreover, the expansion of animal health extension and veterinary services could also be the probable reason for the variation.

The prevalence of ovine lung worm infection revealed a statistically significant variation (P < 0.05) among the age categories, young sheep are more susceptible to lungworm infection than adults. Sheep in the age group of < 1 year and 1-3 years area were more likely to be infected with lungworm than sheep in the age group of >3 years old. The current finding is in agreement with previous studies reported by Feseha and Gebrenegus [18], Yohannes [19] and Teffera et al. [20] who reported young sheep were found to harbor many lungworms than adult sheep. The variation in prevalence among the different age groups might be due to the fact that there is development of acquired immunity in the adults due to previous exposure to the parasite and sheep that have recovered from previous infection have better protection against re-infection [13, 21].
In the present study it was found that female sheep were more likely to be infected with lung worm infection than males and the difference was statistically significant (P<0.05). This result was in agreement with that of the finding recorded by Tewodros [22] in and around Bahirdar reported a prevalence of 28.9% and 13.4% in female and male sheep respectively. Similarly, Tigest [15] in North and South Gondar found a prevalence of 43.3% in Female and 33.57% in Male sheep. This variation might be due to the reason that resistance to infection is decreasing at the time of parturition and during early lactation. This preparturient relaxation of resistance results in the female inability to expel adult worms which cause higher level of larvae detection [21].

According to the physical body condition the prevalence was significantly higher (P<0.05) in those sheep with poor body conditions than in those with medium or good body conditions. The current finding is in agreement with studies reported by Thomson and Orita [23]. The variation in prevalence among the different body conditions might be associated with immuno-suppression in sheep with poor body conditions and concurrent infection by other parasites including gastrointestinal tract helminthes and/or malnutrition [24]. Moreover, it might be due to the fact that poorly nourished animals appear to be less competent in getting ride-off lungworm infection although it is not unusual for well fed animals to succumb to the disease provided the right environmental conditions are made available [8, 25].

Significant variation in prevalence of lungworm infection was found in sheep with respiratory signs compared to apparently healthy sheep. This signifies that sheep showing detected clinical signs have high chance of infection with lung worm infection than apparently healthy sheep. The result coincides with the observation of Alemu et al. [26] and Hasen et al. [27]. This might probably due to the fact that during the end of prepatent phase there is development of bronchitis, is responsible for clinical respiratory sign, developed and caused by immature lungworm in the air ways and cellular infiltration of the epithelium. About 25% of heavily infected and then recovered animal, there is a flare-up of clinical signs during the post patent phase and termed post patent parasitic bronchitis [17].

**CONCLUSION**

The prevalence of ovine lungworm infection recorded in the study area is relatively smaller. Age, sex, body condition and respiratory signs were found significantly associated with the prevalence of lung worm infection in the study area. Female sheep were found to be more susceptible to the infection with lung worm than males. The prevalence of lungworm infection was the highest in those sheep with poor body conditions than in those with medium or good body conditions. Animals showing detected respiratory signs have high chance of infection with lung worm infection than apparently healthy sheep. Lungworm infection in the present study area is a constraint that requires strong attention. Therefore, in light of the above finding, treating sheep with broad-spectrum antihelmentic at the beginning of rainy season would appear to be most effective, separating the most susceptible age groups during the time of pasture contamination are necessary to increase productivity of these animals and extensive extension service including health education must be launched to make the sheep owners aware of the disease.

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**REFERENCES**