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# Coprological Study on Lungworm Infection of Small Ruminants in and Around Eteya Town, West Arsi, Ethiopia

*[1]Yirga Haile, [1]Yasin Mohammed, [2]Tekalign Tadesse and [2]Amanuel Bekuma*

[1]College of Veterinary Medicine, Samara University, P.O. Box: 132, Samara, Ethiopia
[2]College of Agriculture and Forestry, Mettu University, P.O. Box: 318, Bedele, Ethiopia

**Abstract:** A cross-sectional study was conducted from November 2016 to April 2017 to estimate the prevalence of lung worm infection in small ruminants in selected kebele and surrounding village of Eteya in Arsi zone Oromia region, Ethiopia to determine prevalence, risk factors and identifying species of lungworm in small ruminants. Simple random sampling technique was followed to select sampling frame. Fecal samples from sheep and goats of all age groups and both sexes were examined by modified Baermann technique for the extraction of larvae (L1). Fecal examination was conducted in 400 (87 goat and 313 sheep. The overall prevalence of 43% was found by fecal examination. *Dictyocaulus filarial, Protostrongylus rufescens, Muellerius capillar*is and mixed parasitism were identified by faecal examination with total prevalence of 14.8%, 3.3%, 16.3% and 8.8%, respectively. The higher prevalence was observed in female (46%) than male (35.1%). In female (OR =1.908, CI= 1.093 3.331) had higher odds of infection prevalence than males. In age group, higher prevalence was observed in less than one year old (51%) than in age group 13 years old (42.1%) and in age group greater than 3 years old (21.1%). Animals less than one years (OR = 6.049, 95%CI = 3.175, 11.523), age group between 1-3 (OR = 3.584, 95% CI = 1.592, 8.068). The age of the animal was highly significant ($p<0.05$) and body condition in poor (OR = 7.995, 95%CI = 4.272, 14.965), medium (OR = 1.811, 95%CI = 1.061, 3.092), had higher odds of infection prevalence than animals in corresponding groups. The body condition also highly significant ($p< 0.05$). It can be summarized that small ruminant lung worm infection is problem of a significant magnitude in and around Eteya town.

**Key words:** Eteya · Lung Worm · Prevalence · Small Ruminant

## INTRODUCTION

Raising livestock is an important, often the main source of income for millions of small holder farmers in the Asia, Africa and Latin America [1]. The contribution of livestock to human being particularly in developing countries is numerous and small ruminant production is an important component of livestock production in Africa [2] Small ruminants in Africa represent 21% of income (Cash) and food protein for rural farmers in most part of tropics including Ethiopia [3] and skin, fiber, manure and as investment.

Small ruminants are especially important in the more extreme climates and they are noted for their ability to convert low opportunity cost feed in to high value products including, meat, milk, fiber, manure and hides [4] and provided 12.5% of the value of livestock products consumed on the farms and 48% of cash income generated by livestock production though they represented only 6.6% of the capital invested in farm livestock [5].

The prevalence of lungworm infection of small ruminants depends on different factors like, the climate of area, altitude, intermediate hosts and favorable ecological conditions such as rainfall, humidity, temperature and marshy area for grazing, sheep and goat management system for the development of lungworm species [6]. Infections of lung worm parasites of small ruminants are ubiquitous and prevalent within many tropical and sub-tropical environments of the world providing nearly perfect conditions 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 [7].

**Corresponding Author:** Tekalign Tadesse, College of Agriculture and Forestry, Mettu University, P.O. Box: 318, Bedele, Ethiopia. E-mail: tsquaregr@gmail.com.

Numerous researches were done regarding the prevalence lungworm infection of small ruminants in Ethiopia and showed diverse prevalence [8]. However, there was no accurate epidemiological data on the present status of lungworms infection of small ruminants in Eteya and its surroundings.

Therefore, the goals of this investigation were;

- To determine the prevalence of lungworm infection in small ruminants in Eteya and its surrounding areas.
- To identify the species of the lungworms involved and
- To identify associated risk factors of lungworms

## MATERIALS AND METHODS

**Study Area:** The study was carried out from November 2016 to April 2017 in randomly selected two kebeles of the town and three village of surrounding Eteya, Oromia region of Ethiopia. The study area has a latitude and longitude of 08°08'N 39°14'E / 8.133°N 39.233°E coordinates, 08°08'N 39°14'E / 8.133°N 39.233°E with an elevation ranges from 1500 to 4170 meters above sea level. The area covers 937 square km area and 170 km Southeast of Addis Ababa. The area has a bimodal rainfall occurring from March to April (A short rainy season) and from July to October (Long rainy season) and the annual temperature range is 10-22.6°C [9].

**Study Animals:** The study populations were animals kept under the traditional husbandry system and randomly selected small ruminants. In the course of sampling, both sexes and all age groups were involved. These animals originated from peasant association in and around Eteya town. The animals were local (Indigenous) breed. These animals were maintained in small house hold flocks of mixed age for subsistence. Animals were categorized into three age groups, group one (≤ 1 year), group two (1-3) and group three (≥ 3 year) [10].

**Study Design and Sampling Methods:** A cross-sectional study was undertaken in 400 sheep and goat to determine the prevalence of lungworm in small ruminants and to identify the risk factors in and around Eteya town from November 2016 to April 2017. Species of animals, age groups, body condition score and study area were considered as potential risk factors. Simple random sampling was applied to select the study animal in the area.

**Sample Size Determination:** The sample size for the study was calculated by using the formula given by thrust field (1995) with 95% of confidence interval and at 5% precision. The sample size calculated was 384 with sheep about 313 and goat about 87. However, few more samples were added to improve the precision, a total of 400 samples were considered for coprological examination.

**Coprological Examination**

**Sample Collection:** Fecal samples were collected directly from the rectum by two fingers after using gloves of selected animals in a universal bottle, were clearly labeled and then transported to Asela Regional Veterinary Laboratory as soon as possible and each sampled was process by modified Bearmann technique [11].

**Laboratory Technique:** Using Barman technique 10 grams of fresh feces was weighed from each sample. The larvae and enclosed gauze fixed on to astringe rode were submerse in a clean glass tube which was filed with warm water left for 24 hours and the sediment were transferred to the Petri dish for examination of L1 under lower power of microscope after siphoning off the supernatant. Finally if the larvae are detected under microscope the result is recorded as positive if not recorded as negative [12].

**Data Analysis:** The data collected from the study animals during coprological examinations were recorded on specially designed formats. The data were then coded and entered to computer Microsoft excel spread sheet and all the data analysis was done by Statistical Package for Social Science (SPSS) software version 20. The prevalence was computed as the number of animals affected by the lungworms divided by the total number of animals tested multiplied by 100%. The association of the prevalence of lung worm infection with potential risk factors such as species, age, sex, BCS and study area were analyzed by using chi-square ($\chi^2$) test for possible significant difference. The differences were regarded as significant if ($p < 0.05$) and strength of association were analyzed by logistic regression.

## RESULTS

**Coprological Examination:** A total of 400 animals, sheep (313) and goat (87) were examined for investigation of the prevalence of lung worm in and around Eteya town from November 2016 to April 2017. Out of this 43% (172/400) were with lung worms and 3 species of lung worms were identified. For the occurrence of lung worm different risk

factors were under taken. These are sex, age, species, body condition score and address. Association of risk factors with lung worms.

Accordingly, analysis of the risk factors with lung worm (Table 1). Has revealed that; there is a significant association (P< 0.05) ($X^2$>3.84) between sex, age, body condition, address and lung worm infestation. So we use logistic regression to know the strength of association between lung worm and risk factor.

From the Table 1 there was significant relation between sex of animals and occurrence of lung worm ($X^2$= 3.877, p<0.05), the prevalence is high in female animals (46%) as compared with male animals (35.1%) and Female animals was 0.908 times more risk (OR=1.908, 95% CI=1.093-3.331) than those Males (Table 2).

There was a significant association ($X^2$=24.199, p<0.05) between age of the animal and lung worm (Table 1). A significantly higher prevalence of infection

Table 1: Prevalence of lung worm based on different risk factors

| Variable | | No of animals examined | No of animal infected with (%) | $\chi^2$ | P- value |
|---|---|---|---|---|---|
| Sex | Female | 289 | 133(46) | | |
| | Male | 111 | 39(35.1) | 3.877 | 0.049 |
| Age | <= 1 | 253 | 129(51) | | |
| | 1-3 | 57 | 24(42.1) | | |
| | >= 3 | 90 | 19(21.1) | 24.199 | 0.00 |
| Species | Caprine | 87 | 34(39.1) | | |
| | Ovine | 313 | 138(44.1) | 0.697 | 0.404 |
| BCs | Poor | 109 | 75(68.8) | | |
| | Medium | 165 | 62(37.6) | | |
| | Good | 126 | 35(27.8) | 43.512 | 0.00 |
| Address | Guchi | 96 | 32(33.3) | | |
| | Habe | 112 | 43(38.4) | 13.633 | 0.009 |
| | Badosa | 104 | 50(48.1) | | |
| | 01 | 48 | 21(43.8) | | |
| | 02 | 40 | 26(65) | | |
| Total | | 400 | 172(43) | | |

Table 2: The strength of association between lung worm and risk factor by logistic regression

| Variable | | No of animals examined | No of animal infected with (%) | *AOR* | 95 % CI |
|---|---|---|---|---|---|
| Sex | Female | 289 | 133(46) | 1.908 | 1.093-3.331 |
| | Male* | 111 | 39(35.1) | | |
| Age | < = 1 | 253 | 129(51) | 6.049 | 3.175-11.523 |
| | 1-3 | 57 | 24(42.1) | 3.584 | 1.592-8.068 |
| | > = 3* | 90 | 19(21.1) | | |
| BCs | Poor | 109 | 75(68.8) | 7.995 | 4.272-14.965 |
| | Medium | 165 | 62(37.6) | 1.811 | 1.061-3.092 |
| | Good* | 126 | 35(27.8) | | |
| Address | Guchi | 96 | 32(33.3) | 0.239 | 0.100-0.574 |
| | Habe | 112 | 43(38.4) | 0.223 | 0.092-0.539 |
| | Badosa | 104 | 50(48.1) | 0.380 | 0.158-0.915 |
| | 01 | 48 | 21(43.8) | 0.454 | 0.172-1.200 |
| | 02* | 40 | 26(65) | | |
| Total | | 400 | 172(43) | | |

*=Reference

Table 3: Identified lungworm species in the study area

| | No of examined animal (400) | |
|---|---|---|
| Parasite | No of positive | Percentage |
| *Dictyocaulus filaria* | 59 | 14.75 |
| *Muellerius capillaris* | 65 | 16.25 |
| *Protostrongylus rufescens* | 13 | 3.25 |
| Mixed | 35 | 8.75 |
| Total | 172 | 43 |

with lung worm was recorded in ≤ 1 years old animal (51%) followed by 1-3 years old (42.1%) and ≥ 3 years old (21.1%) and ≤ 1 years old animal was 6.049 times more risk (OR=6.049, 95% CI = 3.175-11.523) than those ≥ 3 years old and also 1-3 years old animal was 3.584 times more risk (OR=3.584, 95% CI=1.592-8.068) than those ≥ 3 years old (Table 2).

As shown in the Table 1 body condition of animals have strong relation with presence of lung worm (x2=43.512, p<0.05), where highest prevalence was recorded in poor (68.8%) as compared to, medium (37.6%) and good(27.8%)and Poor BCS animals was 7.995 times more risk (OR=7.995, CI=4.272-14.965) than good BCS animal and likely medium BCS animals was 0.811 times more risk (OR=1.811, CI=1.061-3.092) than good BCS animals (Table 2).

There was association ($x^2$ = 7.033, p<0.05) on the prevalence of lung worm and address of the animal (Table 1), the prevalence is high in 04 kebele (65%) followed by Badosa (48.1%), 01kebele (43.8%) Habe (38.4%) and Guchi (33.3%) and animls found in guchi was 0.761 times less risk (OR=0.239, CI=0.100-0.574) than animals found in 02 kebele and animals found in Habe was 0.777 times less risk (OR=0.223, CI=0.092-0.539) than animals in 02 kebele and animals found in Badosa was 0.62 times less risk (OR=0.380, CI=0.158-0.915) than animal in 02 kebele and finally, animals found in 01kebele was 0.546 times less risk(OR=0.454, CI=0.172-1.200) than those animals found in 02 kebele.

As shown in Table 3 Out of 172 positive results capillaries (16.25%) are most dominant species followed by fillaria (14.75%) and mixed (8.75%). And the list number of infestation was observed in refuscence (3.25%).

## DISCUSSION

A cross-sectional study was conducted from November, 2016 to April, 2017 to determine prevalence, risk factors and species of lungworm. The current overall prevalence was 43% in coproscopical examination. The common species of lungworms in small ruminants were *Dictyocaulu sfilaria*, *Muellerius capillaris* and *Protostrongylus rufescens*. Association of the prevalence of lung worm infection in small ruminants with different risk factors was also assessed and analyzed.

The prevalence of lungworm infection was 43.0% in coprological examination. This finding was closely agreed with previous study done by Sissay [13] reported 43.33% in Dessiezuria District, Northeastern Ethiopia. However, the overall prevalence of lung worm infection in small ruminants recorded in this study was lower than the overall prevalence of lung worm infection in small ruminants that was reported by Bogale *et al*. [14], Serkalem *et al*. [15] and Alemu *et al*. [16] who reported the overall prevalence of lung worm infection in small ruminants, 55.20 %, 53.60 and 52.40 % in Dale district, in Chilalo, munesa district, HitosaWoreda, respectively. Regarding to species, high prevalence of (44.1%) was observed in sheep compared to goat (39.1%) in coproscopic examination, However, there was no significant variation (*P*>0.05) in the prevalence of lungworm infection between goats and sheep.

Regarding sex, high prevalence (46%) in females as compared to (35.1%) in males was recorded in coproscopic examination. The association of lung worm infection in relation to sex of animals was found to be statistically significant (P <0.05). Females were 0.908 times more likely to be infected by lung worm than males. this result was in agreement with previous work done by Paulos [17] in and around Bahir Dar and Tewodrose [18] in North and South Gondar, female 28.9%, male 13.4% and female 43.3% and male 33.57%, respectively. The present study indicated that female animals are more susceptible to lungworm infection than females (P<0.05). This might be also associated to difference in the number of samples in both sexes.

In relation to age of the animals younger sheep were found to be significantly affected (p < 0.05) by the infection of lung worm than adults and older. Young were 6.049 times more likely to be infected by lung worm than old and adult were 3.584 times more likely to be infected by lung worms than old.

While assessing the influence of body condition score on the prevalence of lungworm infection, the prevalence was significantly the highest (p< 0.05) in those sheep with poor body conditions than in those with medium or good body conditions. poor body conditions were 7.995 times (7.995, 4.272-14.965) more likely to be infected by lung worm than in good body conditions and sheep and goat with medium body conditions were 0.811 times (1.811, 1.061-3.092) more likely to be infected by lungworm than good body conditions, this finding were in agreement with [19] who reported that sheep with poor body condition were 5.3 times (5.3, 2.3-12.2) more likely to be infected by lung worm than in good body conditions and goat with poor body condition were 6.1 times (6.1, 2.1-17.6 ) more likely to be infected by lung worm than good body conditions. But, the present result

were in agreement with [20] who reported that sheep with medium body condition were 6.7 times (6.7, 2.4-18.6) more likely to be infected by lung worm than in good body conditions and goat with medium body condition were 7.1 times (7.1, 2.1-27.8) more likely to be infected by lung worm than good body conditions.

This, partly, may be attributed to the nutritional status of the animals. it is well known that poor nutrition lowers both the resistance (Ability to resist the parasites) and resilience (Ability to tolerate or ameliorate the effects of the parasite) of the animal thus enhancing the establishment of worms and increasing the prevalence in poorly conditioned animals [21]. In connection to lungworm, it is reported that poorly nourished animals appear to be less competent in getting rid-off lungworm infection although it is not unusual for well-fed animals to succumb to lungworm infection [22]. And also it could be due to immune-suppression in sheep with poor body conditions, concurrent infection by other parasites including GIT helminthes and for malnutrition [23]. Poorly nourished sheep appear to be less competent in getting rid of lung worm infection [24]. Evidently, the infestation with a parasite by itself might results in progressive emaciation of the animals.

## CONCLUSION AND RECOMMENDATIONS

The study revealed high prevalence of lungworm which had a significant impact on heath and production. The outcome of current study showed that lungworms are the major helmenthosis of sheep and goat in Eteya and its surrounding. The Coproscopical examination of the current study has indicated that 44.1% of the examined sheep and 39.1 % goat were invariably infected with different species of lungworms. All the three important lung worm species: *D. filaria, M. capillaris* and *P. rufescens* were identified in both sheep and goats. However, *M. capillaris* was found predominantly in the study area. Different risk factors affecting the prevalence were body condition, age, sex and species. Female, Lambs, sheep with poor body condition and those with clinical respiratory signs were highly significantly infected with either of the lungworm species than their counterparts. Hence, in light with these findings, the high prevalence of lungworm infection in the study area revealed the need for a higher attention in the control and prevention of the production-reducing parasite.

Based up on the above facts the subsequent recommendations are needed to reduce the prevalence of lungworms infections.

- Further research should be carried out in this area since the prevalence of the diseases/worms was the most important.
- Veterinary service provider in the area should have the facility to diagnose and treat ovine lung worm infected animals to mitigate production losses.
- Draining of marshy area and avoiding grazing in wet areas that is suitable area for the larvae and intermediate host.

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