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Research Article

Prevalence of Lung Worms in Small Ruminants in Ambo Town, Oromia, Ethiopia

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Abstract

Across sectional study was conducted from March 2011 to June 2011 to estimate the prevalence of lung worm infection and to investigate some of the risk factors associated with small ruminants in Ambo town western Ethiopia. Fecal samples were collected from 306 animals (193 Sheep and 113 goats) of the same breeds to examined first stage larvae (L1) using modified Baermann, Innep and Vajas technique. The Overall prevalence recorded by fecal examination was 41.5%. Prevalence of lung worm infection was higher in sheep (44.6%) than in goats (36.3%), but the difference was statistically insignificant (P>0.05). The prevalence of specific infection by *Mullerious Capillaries* was statistically highly significant (P<0.05) between species in which goats were higher infected than sheep. Similarly the prevalence of specific infection by *Dictyocaulus filarial* was statistically highly significant (P<0.05) but here sheep were high infected than goats. The proportion of infection by *Dictyocaulus filarial*, *Mulleriouss capillaries* and mixed infection were 31.6% (61/193), 2.6 % (5/193) and 10.4% (20/193) in sheep and 1.8% (2/113), 20.4% (23/113) and 14.2% (16/113) in goats, respectively. The study showed high prevalence of lungworm that warrants immediate intervention strategies to curtain the effect of the parasite.

Keywords: Ambo town; Lungworm; Risk factors; Small ruminants

Introduction

Small ruminants provide as much as 30% of meat and milk consumed in Sub-Saharan Africa. However, these animals have received much less attention than cattle [1]. In Ethiopia there are about 23.6 million sheep and 18.5 goats [2] which play an important role in the rural economy and enable the country to earn substantial amount of foreign currency through export of skins and other products [3].

Helminthes, parasites of ruminants are ubiquitous with many tropical and sub-tropical environment of the world including Ethiopia providing nearly perfect condition for their survival and development. Although, these parasites are widely prevalent, the clinical signs they showed in infected animals can be less obvious than signs of other livestock diseases [4,5].

Dictyocaulidae and/or certain *metastrognlidae* are known to exist in East Africa (Ethiopia, Kenya and Tanzania) and South Africa [6]. Endo-parasites, including *Dictyocaulusfilaria*, are major cause of death and morbidity in the Ethiopian highlands. Almost half of all deaths and morbidity on farms in Ethiopian highlands are caused by pneumonia endoparasites. Lungworms can result infection of lower respiratory track usually resulting verminous bronchitis or verminous pneumonia. All lungworms are host specific and there is no cross infection, for instance *dictyocaulusfilarial* affects only sheep and goats [7,8].

Control of lung worm infection is essential for releasing the potential of small ruminant production. For proper implementation of control measures, knowledge of the disease and its dynamics must be studied. The incidence of parasitic diseases, including lung worm infection varies greatly from place to place depending on the relative importance of factors involved. However, no studies were conducted so far regarding the respiratory helminthes (Lung worm infection) of small ruminants in Ambo town. Therefore, the objectives of this study was to estimate the prevalence of lungworm infection in small ruminants and assess the associated risk factors in Ambo town.

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Materials and Methods

Study Area

The study was conducted in Ambo town, which is found in west shoa zone of Oromia regional state, Ethiopia. The town is located 114km away from Addis Ababa at an altitude of $8^0$47-$9^0$21N at a longitudinal of $37^0$32'-$38^0$3' E. Topographically, the altitude ranges from 1380-3330m a.s.l. The area experiences rainfall of 800-100mm, of which 70% rain falls highest from June to September and 30% (Short rainfall) from February to April. The maximum and minimum temperature of this area are 29^0C and 15^0C, respectively. The town has three kebeles and within those there are 1285 sheep and 835 goats' population. The livestock production system of this area is an extensive type where animals are kept on grazing pasture, but there is also a limited semi-intensive animal production system [9].

Study Animals

The Study was conducted on small ruminants which are found in all three kebeles of Ambo town on which both extensive and semi-intensive production system practiced. Animals were kept under traditional management system. The breeds of all sheep and goats in the study area were local breeds.

Study Design

Sample size determination and sampling procedure: Across sectional study was conducted from March 2011 to June 2011 to estimate the prevalence of lung worm infection in small ruminants. All the three Kebeles within the town were selected and herds within each kebeles were selected based on accessibility and willingness. Animals within each herd were selected depending on their numbers. If the number of animals are less than or equal to five, all were included in the study and if they are greater than five animals were selected using simple random methods. Aging of small ruminants was made based on the description provided. Therefore, the studied animals are classified into young, adult and old based on their teeth. 3 months to 2 years are considered as young, 2 years-4 years as an adult. Those of greater than 4 years are considered as old. Body condition scoring of small ruminants also was made based on the description provided [10].

The sample size was calculated by using thrust field formula [11] with a precision of 5% and level of confidence interval of 95% using 50% estimate prevalence

$$n = \frac{1.96^2 \times Pexp(1-Pexp)}{d^2}$$ Where, n=the required sample size

Pexp=Expected prevalence

D=Desired absolute precision

The calculated sample size was 384, but due to limitation of time 306 animals (193 sheep and 113 goats) were included in the study.

Study Methodology

Fecal examination: Fecal samples were collected directly from the rectum of sheep and goat in a screw capped glass container and transported to Ambo University Veterinary Laboratory. While collecting fecal samples, the species of animal, sex, age, date of sampling, and Body Condition Score (BCS), were properly recorded. Examination for the presence of larvae (L1) was conducted using modified baermann, Innep and Vajas techniques. When larvae L1 leave the feces and migrate via the gauze and settle down at the bottom of the glass, the supernatant siphoned off and the sediment is examined under a stereomicroscope.

Data Analysis

All obtained data were inserted in to MS - excel spreading sheet and transferred in to the SPSS 15.0 software program. The variations between the different factors were analyzed using chi-square (χ^2). A P –Value less than 0.05 was considered to be statistically significant.

Results

Prevalence

Out of 306 animals (193 sheep and 113 goats) fecal examination revealed the prevalence of lung worm infection to be 44.6% (86/193) in sheep and 36.3% (41/113) in goats (Table 1). The prevalence is higher in sheep than goats, but difference was statistically insignificance (P>0.05).

Table 1: Prevalence of lungworm infection in small ruminants

Animals Spp	No of Examined	No of Positive	Prevalence (%)	95% CI
Ovine	193	86	44.6	37-52
Caprine	113	41	36.3	27-45
total	306	127	41.5	36-47

The proportion of infection by *D.filaria*, *M.capillaries* and mixed infections were 31.6% (61/193), 2.6% (5/193) and 10.4% (20/193) in sheep and 1.8% (2/113), 20.4% (23/113) and 14.2% (16/113) in goats respectively (Table 2).

Associations of Risk Factors with Prevalence of Lung Worm Infection

Regarding Species more animals were included in the study of the ovine and between species the prevalence has been found to be statistically insignificant (P>0.05). However, the prevalence is somewhat greater in sheep (44.6%) than in goats (36.3%). Sex difference and age categories of the small ruminants also were not found statistically significant (>0.05). The prevalence was moderately higher in both young (45.3%) and old (43.5%) than for adults (38.6%), but still, the difference is not statistically significant (P0.05) (Table 3).

There was a highly significant difference in the prevalence of *M.capillaries* (P<0.05) infection between species. Thus, the prevalence was higher in goats (20.4%) than in sheep (2.6%). Among the different age categories, between sex and among different body conditions the prevalence of *Mulleries Capillaries* was found to be statistically in significant (P>0.05). However a slight difference in the prevalence *Mulleries capillaries* within each factor was observed. (Table 4) Shows the association of different host related factors with specific infection by *Mulleries capillaries* in the study area.

There was also a highly significant difference in the prevalence of *D. filaria* ((P<0.05) infection between species. But here the prevalence was higher in sheep (31.6% than in goats (1.8%) with regard to sex, age and body condition. The prevalence was found to be statistically insignificant (P>0.05). However, like that of the above, a slight difference in the prevalence *D.filaria* worm each factor was observed (Table 5).

Table 2: Lung worm infection proportion caused by each parasite species in small ruminants

Infection proportion							
Animal Species	No of Examined	*Mullerius (M)*		*Dictyocaulus (D)*		*Mixed (M+D)*	
		No of Positive (%)	Prevalence	No of Positive (%)	Prevalence	No of Positive (%)	Prevalence
Ovine	193	5	2.6	61	31.6	20	10.4
Caprine	113	23	20.4	2	1.8	16	14.2
Total	306	28	9.15	63	20.6	36	11.8

Table 3: χ^2 test of various risk factors association with the occurrence of lungworm infection

Risk factor		No. tested	No. of Positive	% Positive	χ^2-value	P-value
Species	Ovine	193	86	44.6	2.011	0.056
	Caprine	113	41	36.3		
Sex	Male	93	44	47.3	1.857	0.173
	Female	213	83	38.9		
Age	Young	86	39	45.3	1.176	0.555
	Adult	158	61	38.6		
	Old	62	27	43.5		
Body	Poor	13	3	44.6	2.11	0.348
Condition	Medium	219	91	41.6		
Score	Good	74	33	23.1		

Table 4: X^2 test of various risk factors association with occurrence of *Mullerious* infection

Risk factor		No. tested	No. (%) Positive	X^2-value	P-Value
Species	Ovine	193	5(2.6)	27.052	0.000
	Caprine	113	23(20.4)		
Sex	Male	93	11(11.8)	1.152	0.283
	Female	213	17(8.8)		
Age	Young	86	10(11.6)	1.887	0.389
	Adult	158	11(7.0)		
	Old	62	7(11.3)		
Body Condition Score	Poor	74	7(9.5)	0.042	0.979
	Medium	219	20(9.1)		
	Good	13	1(7.7)		

Table 5: χ^2 test of various risk factors association with occurrence of *Dictyocaulus* infection

Risk factor		No. tested	No.(%) Positive		χ^2 value	P value
Species	Ovine	193	61	(31.6)	38.806	0.000
	Caprine	113	2	(1.8)		
Sex	Male	93	22	(23.7)	0.769	0.381
	Female	213	41	(19.2)		
Age	Young	86	21	(24.4)	1.077	0.584
	Adult	158	30	(19.0)		
	Old	62	12	(19.4)		
Body Condition Score	Poor	74	13	(35.1)	0.865	0.649
	Medium	219	48	(32.4)		
	Good	13	2	(15.4)		

Discussion

The overall prevalence recorded by coprology in the study area was 41.5%. This is lower than some of the previous studies [12] which reported prevalence of 44% and 50% from Bahir Dar and around Kombolcha and Dessie, respectively. The probable reason might be the sample size difference and the dry season when the study conducted that influence the parasites distribution. A relatively higher prevalence of 58% was also reported in Assela [13]. This was due to the right climatic conditions for the parasite in Assela compare to Ambo. Similarly, the relative importance of this disease in sheep and goats has been underlined by other authors.

Relatively, the prevalence of lungworm infection was found to be higher in Sheep (44.6%) than in goats (36.3%) in the study area, but the difference was not found statistically significant. The probable reason for the higher prevalence in sheep might be related to their difference in grazing habits. It has been reasoned that goats are browsers while sheep graze closer to the ground and as a result, sheep have a high chance of acquiring an infective stage parasite (L_3) which is normally found attached to the grass.

The larger proportion of infection (20.6%) due to *D.filaria* in small ruminants than *M.capillaris* (9.15%) disagrees with the previous reports [12] from different parts of the country. similarly [14] suggested that *dictyocaulus* infection in small ruminants does not appear to be a serious problem and the level of infection by *mullerious* was considerably higher than that of *Dictyocaulus.* The extensive distribution and higher prevalence of *M.capillaris* in those previous studies could partly be attributed to its indirect life cycle of using intermediate hosts. However, factors which influence the epidemiology of the intermediate host indirectly determine the epidemiology of the parasite as well. Moisture is considered to be an important factor in determining the survival and availability of land snails. So this could be the possible reason why the prevalence of M.*capillaries* was found to be lower in the present study that was conducted in the dry season of the year, which is not conductive for the intermediate host.

Although it was not found statistically significant, the present study indicated that young (45.3%) and old (43.5%) animals (sheep and goats) are more affected than adults (38.6%) by lung worms. The probable reason for this could be an immature immune system in the young and exhaustion of the immune system in older animals. Sex and body condition also were not found statistically significant. However, slight variations in the prevalence of the disease within these factors were observed. With regard to body condition scores, animals with poor body condition (44.6%) were more affected than those having good (23.1%) and medium body condition. These were related with the level of immunity experienced by those animals having poor body condition.

Conclusions

High prevalence of lung worm infections has been recorded in small ruminants in the studied area on the basis of coprology. Among the three respiratory nematodes, *D.firalia* and *M.Capillaries* were identified. This warrants appropriate intervention strategies.

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