

Prevalence Of Ovine Lungworms In Munesa District, East Arsi, Ethiopia

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Abstract: Across-sectional study was conducted with the aim of determining the prevalence, and the predominant species of ovine lungworms and to evaluate the major host related risk factors on the occurrence of these parasites in sheep from July,2015 to August,2015 in Munesa district /Arsi, south east, Ethiopia. Samples were randomly collected from 384 Sheep from each selected household of peasant associations purposively selected viz . Choba 106, Kersa Ano 86, Doba Ashe 104 and Guri Dangago 88. The raw data was collected on the Specimen Submission Format and examined by using a modified Baermann technique. On overall basis the prevalence was 66.67%. Dictyocaulus filarial was predominant species identified. There was a significant difference ($p < 0.05$) in the infection among age group and body condition of sheep. Odds of sheep with poor body conditions and medium body conditions to be infected with lungworms as compared to sheep with good body conditions is 44.92% (95%CI:4.0033-14.26), 33.20% (95%CI:1.53-4.26) and 21.88% respectively. In conclusion, the study revealed that lungworms belong to the major parasites that effect the health and productivity of sheep in the area, hence, due attention should be given to the sector to mitigate the set back.

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1. Introduction

Ethiopia ranks second in Africa and six in the World in terms of sheep population. Ethiopia with its estimated 25.5 million sheep together with its variation in agro-climatic zones represents a good reservoir of small ruminants' geno types (CSA, 2011). Arsi covers only 2% of the total land area in the country and has an estimated 1,662,797 sheep population. From this population Munesa district host about 103,000 sheep population (LDHO, 2013).

The population is found widely distributed across the different agro-ecological zones of the country (EARO, 2004; Kassahun, 2004). Sheep and goats are owned by smallholder farmers as an integral part of the livestock sub-sector (Workneh, 2000) and contribute to both subsistence and cash income generation (EARO, 2000). Sheep and goats produce only about 16% of the world's Meat, despite their higher contribution to the total world livestock population (CSA, 2003).

Small ruminants are important domestic animals in the tropical animal production system (Devendra and Meclorey, 1990) within African society small ruminant comprise a greater proportion of the total wealth of the poor families, because of the low input requirements such as small initial capital, fewer resources and maintenance cost. They are also able to produce milk and meat in readily usable quantities using marginal lands and poor pasture and crop residues. Furthermore, their production cycle make

them need only short periods to reconstitute flocks after disaster and respond quickly to the demand (Getenby, 1991).

The economic benefits of livestock goods and services, now estimated at 113 billion ETB are more than three and a half times greater than the MOFED'S original estimate of the value added from livestock in 2008-09 of the roughly 80 billion ETB increase in benefits, about 15 billion ETB are derived from recalculating the value of livestock products and the remaining 65 billion come from broadening the estimation to include livestock services. Small ruminants constitute wide verities of uses to the rural economy (IGAD livestock policy initiative, 2011).

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.

Helminthes parasites are among the causes of substantial productivity losses in ovine production of the country (Ahmed, *et al.*, 2007). Other pioneer finding of lung worm infection in sheep in the country indicated its high prevalence and economic importance of the infection in certain areas. Respiratory diseases resulting from helminthes parasites are of a great economic concern in sheep production in the highlands of Ethiopia where sheep are important livestock units (Nibret, *et al* 2011)

Dictyocaulidae and/ or certain Metastrongyloidea are known to exist in East Africa (Ethiopia, Kenya and Tanzania) and South Africa (Torny, 1989) Endo parasites, including *D. filarial*, are major cause of death and morbidity in the Ethiopian highlands. Up to half of all sheep deaths and morbidity on farms in Ethiopia highlands are caused by pneumonia and Endo parasites (ILCA, 1990) A study on required optimal environmental conditions for growth and survival of lungworm larvae in the pasture showed that *D. filarial* could survive well at temperature of 4°C-5°C and high humidity (Kessa, 2005) However, at temperature above 21.1°C the viability of the larvae is seriously degenerated. The larvae of *M. capillaries* can survive for several months in faecal pellets, on herbage and soil under optimum natural climate condition. Since the larvae are able to survive for long periods in intermediate hosts, control of this parasite can be achieved by good grazing management (Soulsby, 1982) thus, control of lungworms need basic information on epidemiology of the parasite and factors affecting the transmission.

The three respiratory parasites that cause a significant damage in small ruminant production are *D. filarial*, *P. rufescens* and *M. capillaries*. These lung worms particularly *D. filaria* can suppress the 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 (Ibrahim, and Degafa, 2012).

Few studies have been conducted in some areas of Ethiopia indicated high prevalence of lung worm infection in sheep population. Knowledge of the current epidemiological situation of lung worm infection in sheep population in the present study area contributes its part to design a control strategy at local, regional and national levels. Lungworms of small ruminants are widely prevalent, the clinical signs they showed infected sheep can be less obvious than signs of other ovine diseases (Hansen and Perry, 1996). Infestation to lungworms in sheep is characteristics by dyspnea, sneezing and cough due to pneumonia. Lungworms infection produces nodules and brownish spots in lung. This signs are diagnosed at post mortem examination during slaughter (Etminan, 1980).

Primary finding of lungworm infection in Ethiopia (Netsanet, 1992; Teffera, 1993; Ayalew *et al.*, 2011; Bekele and Aman, 2011; Hasen *et al.*, 2013) indicated high prevalence and importance of the infection in certain area of the country. In order to investigate a sound lungworm control strategy at local and regional level, further and detailed investigation on epidemiology and importance of lungworms infections with respect to its temporal distribution in necessary.

In Munesa district, lungworm infection still remains an important disease causing high mortality and weight loss of sheep. Hence, the current study was devised to be conducted with the **objectives**.

- To determining the prevalence and related risk factors of lungworm infection in ovine.
- To identify the species of ovine lung worm in the study area.
- To assess the control and prevention methods of ovine lungworm in the study area.

2. Materials And Methods

2.1 Description of the Study Area

Munesa situated at 7°12' to 45° N latitudes and 52° to 39°03' E longitude in central Ethiopia 232km south west of Addis Ababa. The capital town of Munesa district is called Kersa. The area covers 121,730 Hektar topographically Munesa district has high land escarpment and small low land areas. The altitude of the area ranges from 2080-3700m a.s.l and characterized by mid sub-tropical temperature ranging from 5°C – 20°C generally weather conditions are dega; 54%, woinadega; 43% and kola; 3% (CSA of Munesa District, 2013).

The annual average rainfall is 800mm-1200mm and mostly with clay type of soil and rare case black soil. Vegetation of the area changes with altitude and rainfall ranging from scattered trees and bushes to dense shrubs and bushes; Livestock are the major agricultural resources in the area and has livestock population of 230,300 cattle, 103,000 sheep, 9,390 goat, 27,732 horses, 18,806, donkeys 83,806 poultry, 937 mules, 22,764 canines and 12,460 feline (LHDOMW, 2012). According to the statistics of 2008 the total populations of the people were 180682. 89966 male and 90726 female from this; 164225 (90.95%) rural and 16367 (9.05%) town Most of economic income of the society is agriculture and livestock production (CSAMW, 2008). Munesa district has 32 peasant Associations and 6 town kebeles and of these the study was done only 4 of representative peasant Associations namely Choba, Kersa Ano, Doba Ashe and Guri Dangago kebeles. Was selected; by considering their similarity in production system their differences in livestock population.

2.2 Study Animals

The study animals include sheep grazed in extensive system, semi-extensive and those brought to Kersa veterinary clinic. Sheep of age group in young, adult and old age from both sexes, with extensive and semi-intensive husbandry system, dewormed and non-dewormed sheep; and additionally sheep with no clinical respiratory signs and those that appeared apparently healthy was included for convenience, the age of every sampled sheep was categorized in to

young, adult and old using dentition and information from the owners. The body conditions score of study animals divided into good, medium and poor based up on their criteria of body score (Thompson and Meyer, 2002) (Annex 2 and 3).

2.3 Sample Size Determination

The desired 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. Since there was no previous study in the area to establish the prevalence of *Dictyocaulasis*, the sample size will be determined by taking the prevalence of 50% *Dictyocaulasis* using the formula given by

$$n = \frac{1.962 \cdot p_{exp}}{d^2} (1 - p_{exp}) \text{ where}$$

n = required sample size.

P_{ex} = expected prevalence = 50%

d = desired absolute precision 50%

Hence d = 0.05 and

p = 0.5 (50%). Accordingly, the estimated sample size was 384 animals.

2.4 Study Design and Sampling procedure

A cross-sectional study was conducted from July, 2015 to August 2015 in randomly selected study sites to determine the prevalence of lung worm infection and the predominant species of lungworm and to evaluate the effect of study area and major host related risk factors on the occurrence of the parasites in 4 peasant Associations of Munesa district. Simple random sampling technique was utilized to collect all the necessary data from fecal samples and clinical signs of study animals. Sheep from each selected household of peasant associations was examined with different sample size by depending up on their animal population; Choba 106, Kersa Ano 86, Doba Ashe 104 and Guri Dangago 88 sample was examined. The raw data was collected on the Specimen Submission Format (Annex 1)

2.5 Data Collection and Sample processing method

Fresh fecal samples were collected per rectum from individual sheep and immediately taken to Kersa veterinary clinic laboratory and processed by using modified Baermann Techniques as described by Glovirina (1984) and Hansen et al., (1994). Briefly 5gm to 10gm of fecal material was wrapped in double layered gauze and suspended in beaker containing warm water using a clip wire. The faeces were partially immersed in the water and allowed to stand for 24 hours. Then after the wrapped faeces were removed and the supernatant discarded from the beaker, the sediment was transferred to slide or Petri dish for examination of L₁ under stereomicroscope. All larvae were identified morphologically as

described by previous workers. Hansen and B. Perry 1994, Urquhart *et al.*, 1996 and Soulsby, 1982 (Annex 8.4).

2.6. Data Analysis

The results of fecal examination were entered in to Microsoft Excel spread sheets program and then were transferred to SPSS version 16 for analysis. The prevalence of lung worm infection was calculated as the number of samples examined. Logistic regression analysis, odds ratio and 95% confidence interval were computed to see the degree of association of study area and major host related risk factors with ovine lung worm infection. Pearson's Chi-square (χ^2) was used to evaluate the association of different variables with the Prevalence of lungworm P-value less than 0.05 (at 5% level of significance) were considered significant in all analysis.

3. Results

The examination of fecal samples collected from 384 randomly selected animals using a modified Baermann technique revealed an overall lungworm prevalence of 66.67% *D.flaria* (*Dictyocaulus filarial*) was the predominant species in the study area (59.9%), followed by *P.rufescens* (*protostronglus rufescens*, 3.13%), whereas *M.capilaries* (*Muellerius cappillar*is, 1.04%) was the least prevalent. Certain proportion of the investigated animals was also suffering from mixed infection (2.6%). (Table 3).

There was no a significant variation ($P > 0.05$) in the infection rate among the various study area (Table 4) a significant ($P > 0.05$) difference was also not observed in the infection rate between male and female animals. (Table 5).

Taking age of the animals as one of the host related risk factors, lung worm infection was significantly higher ($P < 0.05$) in younger sheep as compared to adult and older ones (Table 5). In relation to the body condition of the animals the prevalence was the most significantly the highest ($P < 0.05$) in those sheep with poor body condition and medium body condition to be infected with lung worms as compared to good body condition (Table 6).

Table 3: Summary of Prevalence of lung worm in Munesa district based on species of the parasites

Species of worms	Number positive	Prevalence (%)
<i>D.flaria</i>	230	59.0
<i>P.rufescens</i>	12	3.13
<i>M.capilaries</i>	4	1.04
Mixed infection	10	2.6
Total	256	66.67

Table 4: Summary of prevalence of lungworms based on study area

Study Area	Number of animals examined	Number of positive (%) out of examined	(95%CI) confidence interval	X ² (P-Value)
Choba	106	76(29.69)		
Kersa Ano	86	51(19.92)	.3147-1.0512	0.072
Doba Ashe	104	71(27.73)	.4703-1.5334	0.588
Guri Dangago	88	58(22.66)	.4143-1.4054	0.386

Table 5: Summary of prevalence of lung worms based on major host related risk factor

Major risk factors	No. examined	No.+Ve%(out examined)	(95%CI)	X ²
Sex	—			
Male	95	59(32.03)		
Female	289	197(76.95)	.8062-2.1173	0.278
Total	384	256		
Age Group				
Young	128	99(38.67)	-	
Adults	128	79(30.86)	.2735-.8154	0.007
Old	128	78(30.47)	.2648-.7883	0.005
Total	384			
Body conditions				
Good	125	56(21.88)	-	
Medium	126	85(33.20)	1.5293-4.2666	0.000
Poor	133	155(44.92)	4.2808-14.4759	0.000
Total	384			

Table 6: Multivariate logistic regression analysis of study and major risk factors with occurrence of ovine lungworm infection

Risk Factors	(95%Confidence Interval)	P-Value
Study Area		
Choba	-	-
Kersa Ano	.2566-.9570	0.037
Doba Ashe	.4137-1.4875	0.457
Guri Dangago	.3561-1.3391	0.273
Sex		
Male	-	-
Female	.6731-1.9397	0.621
Age		
Young	-	-
Adult	.4386-1.4474	0.456
Old	.3223-1.1197	0.109
Body Conditions		
Good	-	-
Medium	1.2822-3.8171	0.004
Poor	4.0033-14.2696	0.000

4 Discussions

The study revealed the presence of *D. filarial*, *p. rufescens* and *M. capillaries* as major respiratory nematodes of sheep in the study area with an overall infection 66.67%. This result is almost in close agreement with the work of Yohannes, (1989) in Debra Tabor Awraja, 70.7%, Brook *et al.*, (1986) in Debra Birhan 64.7%, Mihreteab and Aman (2011) in

Tiyo district 57.1%, Bekele *et al* (1981) in Arsi and Wollo 59.4%, Bekele *et al.*, (1981) in Wollo district 59%, Wondwossen (1992) in Asella 58.8%, The result of the current work is higher than Alemu *et al.*, (2006) in north eastern Ethiopia, 53.6% Poulos, (2000) in Asella, 52.54%, Hasen *et al.*, (2013) in Asella 55.10%, Teffera, (1993) in Dassie and Kombolcha, 50%, Sisay, (1996) in Bahar dar 44.7%, Regassa *et*

a., (2010) in Dassie and Kombolcha, 40.4%, Desta, *et al.*, (2010) in Ambo District, 34.90%.

However, the present finding is lower than prevalence reported by Eyob & Matios, (2013) in Asella province, 72.44%, Netsanet, (1992) in Debra Birhan 73.75%, Sefinew, (1999) in Wollo district 71.3%, Jovanovich *et al.*, (1960) in high land of Shoa 83-99.5% .

The possible explanation for such infection rate variation could be attributed to variation in agro-ecology, altitudes rainfall, humidity and temperature difference and season of examination the respective study areas, which favor or disfavor the survival of parasite larvae (Blood, 1976; soulsby, 1982; Brad ford 2002).

With regard to the species of lung worms, it was observed that *D.flaria* was the predominant species in the area followed by *P. rufescens*, whereas *M .capillaries* was the least prevalent. This finding is supported by (Netsanet, 1992, Nemat and Moghadam, 2010 and Mihreteab and Aman, 2011) who reported *D. flarial* to be the most prevalent in their survey. In contrast to these findings, Sisay, 1996, in Bahar Dar and Mezgebu, 1995, in Addis Ababa reported that *M. capillaries* is the most prevalent.

The possible explanation for the predominance of *D.flaria* in the study area might be attributed to the difference in the life cycles of the parasites. Thus, *D.flaria* has a direct life cycle and requires shorter time to develop to an infective stage, according to (Soulsby, 1982), after ingestion, the larvae of these parasites can be shed with feces within 5 weeks. Compared with *D.flaria* the transmission of *P.rufescens* and *M. capillaries* is epidemiologically complex event involving host, parasite and inter mediate host. In addition to this the low prevalence of both *M. capillaries* and *P.rufescens* in the study are might be attributed to the fact that the study was done in dry season which does not favor the development of the snail inter mediate hosts, *M. capillaries* and *P.rufescens* in sheep require slugs or snails as inter mediate hosts, which must be eaten for infection to occur (mark Vet. Manual, 2011) mixed infection was observed in the current study as in many previous studies (Wondwossen, 1992, Poulos, 2000, and Hansen, and Perry, 1994).

On the attempt to assess the influence of the study area on lung worm infection of sheep Insignificant effect ($P > 0.05$) was observed on the prevalence of lung worm infection among the various. Thus, the prevalence was similar within study areas. This insignificant difference; that agrees with the report of, Desta B. *et al.*, 2010, in Ambo Wondwossen, T., 1992, in and around Asella In contrary to the present study, an area has a significant differences a result reported by Alemu *et al.*, 2006.

This result of area significant is due to the previous worker collected their samples from highland, midland and lowland altitudes. Whereas in the present study samples were collected all from mid- land altitude areas. In the present study, sex dependent variation was not en countered hence both sexes showed almost equal susceptibility to infection with lung worms. This was coinciding with research study reported by (Addis *et al.*, (2011), Nibret *al.*, (2011), Dawit and Abdu (2012), Eyob and Matios (2013) and Hasen *et al.*, (2013) but disagree with report of Alemu *et al.*, (2006) and Mihreteab and Aman (2011) and Desta. *et al.*, (2010) These may be due to the fact that improper distribution of samples selection between the two sexes (Poulos, 2000); or else most of the sample females are not in pre-parturient period during the study time (Urquhart *et al.*, 1996).

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. This finding is in agreement with Uqbazghi, (1990), Mihreteab and Aman (2011) and Wondwossen, 1992) who reported that young sheep were found to harbor as many lung worms as compared with adult and older sheep This has been partly explained by the acquired immunity developed in adult and older animals due to previous exposure and sheep that recovered from the infection have better immunity against re-infection (Soulsby, 1982; Craig, 1998, Mihreteab. and Aman (2011).

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. The odds of sheep with poor body conditions and medium body conditions to be infected with lung worms as compared to sheep with good body conditions were higher. This in accord with the report of Thomson and Orita (1988).

The possible explanation for this observation could be due to immune-suppression in sheep with poor body conditions, concurrent infection by other parasites including GIT helminthes and for malnutrition (Kimberling, 1998). Poorly nourished sheep appear to be less competent in getting rid of lung worm infection (poulos, 2000, Hansen, *et al.*, 1994, Uqbazghi, 1990). Evidently, the infestation with a parasite by itself might results in progressive emaciation of the animals.

5. Conclusions And Recommendations

The result of present study indicated that lungworms are the major helmenthosis of sheep in Munesa district, E/Arsi zone. The Coproscopical examination of the current study has indicated that

66.67% of the examined sheep were invariably infected with different species of lungworms. 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. Out of the recovered lungworms (*D. filarial*, *M. capillaries* and *P. rufescens*), *D. filarial* was found to be the significant highly prevalent lungworm of ovine's in the study area. 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 disease/parasite.

Based up on the above conclusions the following recommendations are needed to reduce the prevalence and incidence of lungworms infections.

✓ Further research should be carried out in this study area since the prevalence of the diseases/worms was the most significant.

✓ Veterinary service provider in the area should have the facility to diagnose and treat ovine lung worm infected animals to mitigate production losses.

✓ More attention should have given to the control and prevention of respiratory parasites of small ruminants through the integrated disease control strategy.

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