Prevalence Of Ovine Lung Worm Infection In Mekelle Town, North Ethiopia

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Citation

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Abstract

A cross-sectional study was conducted in Mekelle town, North Ethiopia from November 2010 to March 2011 to estimate the prevalence of ovine lungworm infection and to investigate some of the risk factors associated with it. Faecal samples were collected from randomly selected 402 sheep under extensive and semi intensive husbandry systems to examine first stage larvae (L1) using Bearmann technique. One hundred were subjected to postmortem examination to detect the presence of adult lungworm parasites. The overall prevalence recorded by faecal and postmortem examination was found to be 13.4% and 15%, respectively. The proportions of infection by Dictyocaulus filaria (D. filaria), Mullerius capillarius (M. capillaris) and Prostrongylus rufescens (P.rufescens) were found to be 5.9%, 3.5% and 2.74%, respectively. Lambs, female animals and those sampled during November had higher infection prevalence than animals in corresponding groups with statistically significant variation ($p<0.05$). The prevalence of sheep lungworm under extensive and semi intensive management systems showed no significant variation ($P>0.05$). Postmortem examination carried out on 100 sheep revealed that coproscopic examination had limited value in terms of estimating the prevalence of lung worm infection in live sheep and implies as there was no direct correlation between the adult worm burden and faecal larval output. Thus, lungworm infection is an important parasitic disease in and around Mekelle and further investigation is warranted to assess its impact on the economy and to reduce its incidence.

INTRODUCTION

Ethiopia has the largest livestock inventories in Africa, including more than 38,749,320 cattle, 18,075,580 sheep, 14, 858,650 goats, 456,910 camels, 5,765,170 equines and 30,868,540 chickens with livestock ownership currently contributing to the livelihoods of an estimated 80% of the rural population (CSA 2009). In Ethiopia, sheep are the dominant livestock providing up to 63% of cash income and 23% of food substance value obtained from livestock production. Sheep play a vital role as sources of meat, milk and wool for smallholder keepers in different farming systems and agro-ecologcal zones of the country (Ehui et al 2003; Kassahun 2004; Markos 2006; Getahun 2008; FAO 2009). They are also sources of foreign currency (Berhanu et al 2006). 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 sheep production.

Helminth parasites of ruminants are ubiquitous, with many tropical and sub-tropical environments of the world providing nearly perfect conditions 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 (Hansen and Perry, 1996). The various species of gastrointestinal and pulmonary nematodes, trematodes and cestodes are known to be prevalent in Ethiopia (Ahmed et al 2007).

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. Dictyocaulidae and certain Metastrongylidae are known to exist in East Africa including Ethiopia (Tony 2006). The three respiratory parasites that cause a significant damage in small ruminant production are Dictyocaulus filaria, Protostrongylus rufescent and Muellerius capillarius. These lungworms particularly Dictyocaulus filaria can suppress the immunity of the respiratory tract (Gelagay et al 2005) 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.

The incidence of respiratory helmenthiasis varies greatly from place to place depending on the relative importance of associated risk factors. Although environmental conditions

are conducive for lung worm infections in sheep in the highlands of Tigray and lungworm infection is considered an important disease in this region, very limited studies have been conducted so far. Hence, this study was conducted with the objectives of to determine the prevalence of lungworm infection in sheep in Mekelle town, to identify the species of the respiratory helminthes circulating in Mekelle town and to investigate risk factors associated with lungworm infection in area.

MATERIALS AND METHODS

STUDY AREA

The study was conducted in Mekelle, the capital city of Tigray region, which is located 783kms north of Addis Ababa. Geographically; it is located between 39°24'30'' to 13°36'52'' latitude and 39°25'30'' longitude. It lies in an altitude range of 2000-2200 meter above sea level. The average temperature ranges of the year ranges from 11-24°c. The total annual rainfall is 579mm-650mm. The weather condition is hot and humid. The livestock population of the area includes a total of 36516 cattle; 8442 shoats; 800 horses; 200 mule; 3080 donkey; 100 camel; 53796 poultry; 3000 dogs (MZAO 2009).

STUDY ANIMALS

Fresh feacal samples were collected from randomly selected 402 sheep under the extensive and semi intensive husbandry systems found in Mekele town.

STUDY DESIGN

A cross sectional study was conducted to determine the prevalence of ovine lung worm infection.

SAMPLING METHOD AND DETERMINATION OF SAMPLING SIZE

Simple random sampling technique was used. To calculate the total sample size, the following parameters were used: 95% Level of Confidence (CL), 5% desired level of precision and with the 11% (Frewengel 1995) expected prevalence of lung worm in sheep and then inflating the number (150) by 2-3 folds it was 402, to account for the effect of randomness and representativeness in sampling (Thrusfield 2005) using the formula:

Figure 1

$$n = \frac{1..96^2 \times P\,exp\ (1- Pexp)}{d^2}$$

Where,

n = required sample size

Pexp = expected prevalence

d^2 = desired absolute precision

SAMPLE COLLECTION

FAECAL SAMPLES

Faecal samples were collected directly from the rectum of selected animals in a universal bottle and packed in an icebox and then transported to Mekele Regional Veterinary Laboratory and each sample was processed by Bearmann and modified Bearmann technique as described by Charles and Robinson (2006). While collecting faecal sample, the species of the animals, sex, age, overt clinical signs of lungworm infection, and date of sampling were properly recorded.

IDENTIFICATION OF ADULT WORM

A total of 100 lungs were collected from Abergelle export slaughter house and different restaurants and examined for the presence of lungworm parasitic species as follows:

Examination procedures: The respiratory tract was recovered from each animal and taken to the laboratory for examination of parasitic nodules. All suspected nodules were examined in detail by dissection. The trachea and main bronchi were opened with a pair of scissors, searched for the presence of adult worms and all visual parasites were collected. The lungs were cut to pieces 1-2 cm. diameter and placed in physiologic saline solution in an incubator at 37°C for two hours. The lung pieces were removed and remaining fluids were poured through a screen. Parasites were collected under the stereo microscope. Identification of adult parasites was done by direct microscopy (Umur et al 2006).

DATA MANAGEMENT AND ANALYSIS

Data was managed using Ms-excel worksheet and analyzed using SPSS version 16, descriptive statistics used to determine the prevalence of lungworm and associated risk factors. The different variables such as sex, age, season and management systems were analyzed as risk factors.

RESULTS

OVER ALL FIELD PREVALENCE UNDER COPROSCOPIC EXAMINATION

A total of 402 sheep examined from different extensive and semi intensive husbandry systems were examined under coproscopy. Of the total sheep examined under coproscopy, the overall prevalence was found to be 13.4%. The lungworm species encountered during study were D.filaria (5.9%), P.rufuscens (3.5%), M.capillarius (2.74%) and Mixed infection (1.24%) with significant variation (P<0.05).

PREVALENCE OF LUNGWORM INFECTION ON THE BASIS OF SEX

Of the total sheep examined female (253) and male (149) the overall infection prevalence of female was significantly (P<0.05) higher than males. Of there covered lungworm species, D.filaria tend to infect predominantly female sheep with significant variation

(P<0.05) than M.capillarius and P.rufuscens as indicated in the Table 1 below.

Figure 2

Table 1: Prevalence of lungworm infection based on Sex

Sex	Total examined	Lungworm species				positive
		D.filaria	*P.rufuscens*	*M.capillarius*	Mixed infection	
Female	253	20(7.9%)	12(4.7%)	8(3.2%)	2(0.8%)	42(16.6%)
Male	149	4(2.7%)	2(1.3%)	3(2.01%)	3(2.01%)	12(8.1%)
Total	**402**	**24(5.9)**	**14(3.5%)**	**11(2.74%)**	**5(1.24)**	**54(13.4)**
Sex	Total examined	Lungworm species				positive
		D.filaria	*P.rufuscens*	*M.capillarius*	Mixed infection	
Female	253	20(7.9%)	12(4.7%)	8(3.2%)	2(0.8%)	42(16.6%)
Male	149	4(2.7%)	2(1.3%)	3(2.01%)	3(2.01%)	12(8.1%)
Total	**402**	**24(5.9)**	**14(3.5%)**	**11(2.74%)**	**5(1.24)**	**54(13.4)**

PREVALENCE OF LUNGWORM INFECTION BASED ON AGE

The overall lungworm in lamb and adult was 20.6% and 8.7%, respectively, revealing a statistically significant variation (P<0.05) between age groups. The infection prevalence

of lungworm was higher in lambs than adults. D.filaria and M.capillarius tends to infect lambs predominantly than P.rufuscens which infects adults mostly with statistically significant variation (P<0.05) (Table 2).

Figure 3

Table 2: Prevalence of lung worms in different age groups

Age	Total examined	Lungworm species				Total positive	Overal l P (%)
		D.filaria	*P.rufuscens*	*M.capillarius*	Mixed infection		
Lamb	160	17(10.6 %)	6(3.75%)	9(5.6%)	1(0.63%)	33(20.6%)	20.6%
Adult	242	7(2.9%)	8(3.3%)	2(0.8%)	4(1.7%)	21(8.7%)	8.7%
Total	**402**	**24 (5.9%)**	**14 (3.5%)**	**11 (2.74%)**	**5 (1.24)**	**54 (13.4%)**	**13.4%**

PREVALENCE OF LUNGWORM INFECTION BASED ON MANAGEMENT

The overall prevalence of sheep under extensive and semi intensive managements was 14.9% and 12.6%, respectively. This revealed that lungworm prevalence did not show a significant variation (P>0.05) based on management. D.filaria prevalence was slightly higher in extensive than the other lungworm species with no significant variation (P>0.05) as indicated in the Table 3.

Figure 4

Table 3: Prevalence of lungworm infection based on management

Mgt	Total examined	Lungworm species				positive
		D.filaria	*P.rufuscens*	*M.capillarius*	Mixed infection	
Extensive	221	15(6.8%)	9(4.1%)	7(3.2%)	3(1.4%)	34(15.4%)
Semi intensive	181	9(4.9%)	5(2.8%)	4(2.2%)	2(1.1%)	20(11.05)
Total	**402**	**24(5.9%)**	**14(3.5%)**	**11(2.74%)**	**5(1.24)**	**54(13.4%)**

MONTHLY PREVALENCE OF LUNGWORM INFECTION UNDER COPROSCOPY

Monthly prevalence of lungworm infection was found to be higher in November (22.8%) and lower in March (7.9%) with significant variation (P<0.05). The infection prevalence was equally significant in January and February as shown in Table 4 below.

Figure 5

Table 4: Monthly prevalence of lungworm infection

Months	Total examined	Lungworm species				Total positive	Overall P (%)
		D.filaria	*P.rufuscens*	*M.capillarius*	Mixed infection		
November	101	8(7.9%)	7(6.9%)	5(4.9%)	3(2.97%)	23(22.8%)	22.8%
December	137	6(4.4%)	3(2.2%)	2(1.5%)	1(0.7%)	12(8.8%)	8.8%
January	71	4(5.6%)	2(2.8%)	3(1.41%)	0	9(12.7%)	12.7%
February	55	5(9.1%)	1(1.8%)	0	1(1.8%)	7(12.7%)	12.7%
March	38	1(2.6%)	1(2.6%)	1(2.6%)	0	3(7.9%)	7.9%
Total	**402**	**24(5.9%)**	**14(3.5%)**	**11(2.74%)**	**5(1.24%**	**54(13.4%**	**13.4%**

OVER ALL PREVALENCE UNDER POST

MORTEM EXAMINATION

Of the total 100 sheep examined at post mortem the overall prevalence of lung worm infection was about 15.0% with significant variation (P<0.05) between each lungworm species. Of the three lungworm species D. filaria was found with 6%, P. rufuscens 3%, M. capillarius 5% and 1% of Mixed (two or three species) infection.

POST MORTEM PREVALENCE BASED ON SEX

Of the total male (67) and female (33) examined at postmortem, overall infection prevalence of male and female was 9% and 27.3% respectively, with significant variation of (P<0.05) prevalence under sex groups (Table 5). In addition, the infection prevalence showed significant variation (P<0.05) between each lungworm species.

Figure 6

Table 5: Prevalence of lung worm infection on the basis of sex during post mortem examination

Sex	Total examined	Lungworm species				positive
		D.filaria	*P.rufuscens*	*M.capillarius*	Mixed infection	
Female	33	4(12%)	2(6.1%)	3(9.1%)	0	9(27.3%)
Male	67	2(2.9)	1(1.5%)	2(2.9%)	1(1.5%)	6(9%)
Total	**100**	**6%**	**3%**	**5%**	**1%**	**15%**

POST MORTEM PREVALENCE BASED ON AGE

Of the total lamb (40) and adult (60) examined, the overall prevalence was 17.5% in lamb and 13.3% with no significant variation (P>0.05) between two age groups. In addition, the prevalence of each lungworm species is higher in lamb than adult with statistically significant variation (P<0.05) (Table 6).

Figure 7

Table 6: Prevalence of lung worm infection on the basis of age during post mortem examination

Age	Total examined	Lungworm species				positive
		D.filaria	*P.rufuscens*	*M.capillarius*	Mixed infection	
Lamb	40	2(5%)	1(2.5%)	4(10%)	0	7(17.5%)
Adult	60	4(6.67%)	2(3.33%)	1(1.67%)	1(1.67%)	8(13.3%)
Total	**100**	**6(6%)**	**3(3%)**	**5(5%)**	**1(1%)**	**15(15%)**

DISCUSSION

Of the total sheep examined the overall prevalence rate of 13.4% was recorded by coprology in this study. This finding agrees with data reported by Frewengel (1995) in Tigray where the prevalence rate was found to be (11.24%), and Teferra (1993) at Deseie and Kombolcha where the prevalence was (15.47%). The overall prevalence recorded is lower than that of Mengestom (2008) in Atsbi woreda where the recorded prevalence was (21.5%), Eyob (2008) in Assella, where the prevalence rate was (72.44%), Abdukadir (2009) in and around Kombolcha, (42.96%) and Mekonen et al (2011) in Gondar town, (33.83%). Such variation in the infection rate could be attributed to the variation in altitude, rain fall, humidity and temperature in different areas of the country.

Three respiratory nematodes: D. filaria, M. capillaris and P. rufescens were identified. Dictocaulus filaria was the most prevalent (5.9%) of the total samples examined in the study area and agrees with the previous report of Uqubazgi (1990) in Hamase Awraja and Mekonen et al (2011) in Gondar town but it disagree with the report of Sissay (1996) in Bahirdar (39.3%) and Mezgebu (1995) in Addis Ababa who reported as M. capilaris is the most prevalent. These variations could be due to different transmission dynamics P. rufescens and M. capillaries and susceptibilities of the P. rufescens and M. capillaries in the two hosts. Inaddition, dry season is not suitable to intermediate host snail species (Urquhart et al 1996) and Dictocaulus filaria reach the infective stage within less time (Soulsby 1986).

In the current study female animals are more susceptible to lungworm infection than males ($p < 0.05$) and concur with earlier observation of Abebe (2008), Alemu et al (2006) and Mekonen et al (2011). The high prevalence in females could be related to physiology of reproduction (Craig 1998) and difference in management.

With regard to age, the overall prevalence of lungworm infection studied was higher in lambs (< 1year) than adult (>1year). This finding agrees with data reported by Radostitis et al (2007), Urquhart et al (1996) and Mekonen et al (2011) who reported that young sheep were found to be infected more than adults and this was contrary to the report by Alemu et al (2006) and Alemayehu et al (2010). This might be associated with the naturally acquired immunity against infection slowly develops with age and D. filaria infection decrease with increasing age of the animal.

The overall prevalence of lung worm infection was higher under extensive than semi intensive management system and in line with reports of Sissay (1996) and Mekonen et al (2011), this could possibly be associated with receiving an inadequate keeping and poor conditions of sheep in

extensive management system, animals under well nourishment and watering lead to less risk of helminth (ILCA 1993).

Regarding the distribution of infections according to months the highest worm load of D. filarial, P. rufescens and M. capillarius were observed during November and decrease and reach to minimum during March, which coincides with previous reports (Alemayehu et al 2010; Frewengel 1995 and Bekele et al (1981). This could imply that the distribution of lungworms shown that a cool environment is very suitable for the development of D. filaria and third stage larva (L3) is resistant to cold (Kusiluka and Kambarage 2006). Inaddition survival and development of larvae is favored by low moisture and high humidity (Ayalew et al 1993).

The prevalence of lungworm infection during postmortem examination of slaughtered sheep was higher (15%) than the result obtained at coprology (13.24%). This finding is in line with the observations of Abebe (2008), Alemu et al (2006), Oncel (2000) and Yildiz (2006) but not in agreement with reports of Alemu et al 2006 and Mekonen et al 2011. This difference could possibly be attributed to the difficulty to detect these nematodes by coproscopic methods (Girisgin et al 2008) and lower number of animals examined in the postmortem examination (Alemayehu et al 2010).

CONCLUSION

In the present study the infection prevalence of lungworm has no significant association with management system of sheep; other epidemiological risk factors such as age, sex and season have great contribution to the prevalence of lungworm infection in the study area. Though both coproscopic and postmortem examination results confirmed the existence of lungworm infection, the coproscopic examination had limited value in terms of estimating the prevalence of lungworm infection in live sheep as compared to the postmortem examination. Grazing management and Regular strategic deworming of the whole flock (especially when infected sheep are present) with broad spectrum anthelimenthics rather than treating individuals is recommended.

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