



Science

CROSS-SECTIONAL STUDY ON EQUINE LUNG WORM AND ASSOCIATED RISK FACTOR IN AMBO DISTRICT, OROMIA REGION, ETHIOPOIA

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Abstract

To determine the prevalence of lungworm, *Dictyocaulus arnifieldi* and identify risk factors associated with occurrence of diseases in equines in and around Ambo town, in Oromia region, Ethiopia.

Equine lungworm, *Dictyocaulus arnifieldi* is a parasitic disease that affects horses, donkeys and mules, is widespread in study area. The infection is transmitted by ingestion of contaminated pasture which contains infective stage larvae of *Dictyocaulus arnifieldi*. To-date, effective control program still remains to be a reality and needs to be strengthened.

Purposive sampling technique was used to select study animals and performed using modified Berman technique in Ambo University veterinary laboratory technology. Descriptive statistics and logistic regression used to analyze using STATA statistical software version 9.

From the total 384 equines (donkeys, n= 313, mules, n= 29, and horses, n= 42) the positive animal was 77 resulting the overall prevalence 20.1% equine lungworm. There is significance difference between Kebele (small administrative unit), age, body condition and seasons of the study period (p<0.05).

The study suggests that the community of the study area was highly affected lungworm infection, *Dictyocaulus arnifieldi*. Therefore, awareness should be created to the owners regarding the management system of equine was recommended.

Keywords: Lung Worm; Parasitic Disease; *Dictyocaulus arnifieldi*.

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1. Introduction

Ethiopia has 1.91 million horses, 6.74 million donkeys, 0.35 million mules [1]. Equine (donkeys, mules and horses) play an important role as working animals in many parts of the world, for packing, riding, carting and sloughing and the same is true in Ethiopia especially in both rural and urban transport system. This is because of its cheapness and availability and so provides the best alternative transport means in places where the road network is insufficiently developed and the landscape is rugged and mountainous and in the cities where narrow streets prevent easy delivery of cars [2].

Even though mules, horses and donkeys have often been described as sturdy animals; they succumb to a variety of diseases and a number of other unhealthy circumstances. Among these, parasitic infection is a major cause of illness [3]. Different parasite has been reported to cause respiratory problem in equines [4]; [5]. Of these Dictyocalus species has been reported to be the major cause due to the fact that the equine is natural reservoir of the parasite and the parasite being ubiquitous in nature [6]; [4]; [7]. The genus Dictyocalus is live in the bronchi of cattle, sheep, horses, donkeys, mules and hinnies and has been found throughout the world. This genus has three species; *D. viviparous*, *D. airfield* and *D. filarial*, of these *D. arnfieldi* affect equines [6]; [8].

In horses its prevalence is difficult to establish since infection is rarely become patent, although it is frequently incriminated as the cause of chronic coughing and increase respiratory rate. However patent infection may develop in foals and these are not usually associated with clinical sign [6]. Donkeys acquire infection as foals and yearling and tend to remain infected, presumably through re-exposure all their lives. Young animal suffer more as compared to the older animals [6]; [9]. Patent infections usually establish during the first season at grazing and in the absence of anthelmintic therapy, the majority of animals subsequently remain infected throughout their live and act as the source of infection for other [10].

In donkeys and horses, adult parasite have been found in lungs throughout the year .In large study performed over one year in Kentucky ,United states of America, lung Worm infected horses were found in each month of the study [8]. Another study by [11] also showed *D.arnfieldi* infection to be present through the year in Moroccan donkey with annual incidence of 47.8%. A preliminary study conducted by [5] on the helimithosis of equine in south and north wollo zone reported 22.36% of examined donkeys (n=331) and 8.89% of examined mules (n=46) had *D. arnfieldi*. Although lungworms are known to be widely distributed in Ethiopia, documented studies are rare. A cross-sectional study conducted in north east Ethiopia by [12] showed an infection rate of 53.6% ante mortem examination and 66.3% by post-mortem examination. In Ethiopia 83% from six donkeys were reported to have been infected with *D. arnfieldi* [2].In study area there is mixed farming system and equine play essential role in the life of the farmer. They used for traditional sport, as ambulance for transportation of people, transportation of goods and water. But there is no research done on equine lung worm in Ambo woreda.

Therefore taking in to account of this parasite in equine, this study was targeted to fill the information gap in the area with the following objectives.

- To estimate the prevalence of lung worm infection in equine

- To assess risk factor associated with lung worm
- To provide information on control and prevention of the disease.

2. Materials and Methods

2.1. Study Area

The study was conducted at Ambo town and its surrounding kebeles (small administrative unit), west Showa Zone, Oromia Regional State, located at a distance of about 107km from Addis Ababa to the west direction. The altitude of the area ranges from 1380-3330 meters above the sea level and receive annual rain fall 900 millimeters with average minimum and maximum temperature of 15⁰c and 29⁰c respectively. In study area there is mixed farming system and equine play essential role in the day to day life of the farmer and there is traditional management system of equine.

2.2. Study Type and Study Population

A cross- sectional study type was carried on the purposively selected 384 equine (42 horse, 313 donkey and 29 mule) found in and around Ambo town.

2.3. Sample Size and Sampling Procedure

The study type was cross- sectional and it was a simple random sampling technique used to select individual study animals. The desired sample size was calculated according to formula given by [13] at 50% expected prevalence setting 95% confidence interval and a P value of less than 0.05 was taken as statistical significant. Therefore, the calculated sample size was 384.

Study Methodology

Fecal samples were collected directly from the rectum of the animal using sterile glove and placed in sample a vial which was labeled accordingly and brought to the veterinary laboratory technology. Fecal samples were processed on the day of collection and fecal examination was performed using modified Berman technique as stated by [14].

Suring sampling some of the potential risk factors such as age, body condition and sex were collected. They were all local breeds, kept under extensive management system.

Data management and analysis

The data were recorded on specially designed forms and preliminary analysis was done in Microsoft Excel. The outcome variables were the cases of lungworm L1 larvae detected during the fecal examination (positive =1 or negative= 0). Descriptive statistics was carried out to summarize the prevalence of the disease and proportion of infection in each species. Logistic regression analysis was conducted to see the association between the risk factors and the occurrence of the disease. Confidence interval and p- value was seen to see the presence of association and Odds Ratios was employed to assess the strength and direction of this association using STATA statistical software version 9.

3. Results

Form the total 384 equines (donkeys, n= 313, mules, n= 29, and horses, n= 42) the positive animal was 77 resulting the overall prevalence 20.1% equine lungworm. The prevalence in each species was found to be 18.2%, 24.1% and 31.0% in donkeys, mules and horses, respectively with no significance ($P>0.05$) association between them.

Table 1: The occurrence of the lungworm infection in equine

Species	No tested	Number positive	Prevalence (95% CI)	X ² (p-value)
Donkey	313	57	18.2(14.1,23.0)	4.1(0.128)
Mule	29	7	24.1(10.3,43.5)	
Horse	42	13	31.0(17.6,47.1)	
Total	384	77	20.1(16.1,24.4)	

The multivariable logistic regression analysis of the risk factors with the occurrence of lungworm infection indicated the presence of significant difference between the infection occurrence and kebeles, age, body condition score of the study animals and months of the study period ($p<0.05$). Hence, it was observed that the chance of occurrence of lungworm infection in kebele 3 ($p=0.04$, OR = 5, 95% CI 1, 32), age between 8 and 11 years ($p=0.00$, OR = 7.6 95% CI = 2.65% CI= 2.6, 21.7), animals with poor body condition score ($p = 0.00$, OR = 4.8, 95% CI 2.2, 10.9) and in month of March ($p=0.012$, OR = 7.6, 95% CI 1.6, 32) than the rest of kebeles, age of less than 5 years, animals with good body condition score and the rest of the study period, respectively. One the other hand, there is no statistically significant difference in the prevalence of lungworm with species, work type and deforming history of the animals.

The univariate analysis revealed the existence of association between lungworm infection and sex of animals with the higher occurrence in males than females. Form 94 animals with cough were 46 (48.9%) are positive for lungworm infection and from 290 animals with no cough were 31(10.7%) animals are positive for lungworm infection.

Table 2: Analysis of the risk factors with occurrence of lungworm infection in equine

Risk factor	No tested	Number positive	Crude OR (95% CI)	P- value	Adjusted OR (95%CI)	P – value
Kebele 1	75	13(17.3)	1		1	
2	51	10(19.6)	1.2(0.5,4.7)	0.745	1.9(0.5,6.7)	0.343
3	42	5(11.9)	1.6(0.5,4.7)	0.431	5.1(1.1,23.0)	0.041
Senkele	70	20(28.6)	2.0(0.8,4.2)	0.109	1.2(0.4,3.8)	0.712
Hawaro	103	16(15.5)	1.1(0.5,2.5)	0.750	1.5(0.6,4.2)	0.401
Gosu qora	43	13(30.2)	2.1(0.9,5.2)	0.091	1.2(0.3,3.7)	0.934
Sex Female	209	29(16.3)	1		1	
Male	175	43(24.6)	1.7(1.2,8.1)	0.040	1.2(0.6,2.8)	0.600
Age < 5 year	101	29(28.7)	1		1	
5-8 year	130	20(15.4)	2.2(1.2,4.2)	0.020	3.6(1.4,9.6)	0.009
8-11 year	118	21(17.8)	1.9(1.0,3.5)	0.061	7.6(2.6,21.7)	0.000
>11 year	35	7(20.0)	1.6(0.6,4.0)	0.301	7.3(1.7,28.0)	0.006

Deworm	No	269	57(21.2)	1		1	
	Yes	115	19(16.5)	1.3(0.8,2.4)	0.301	1.4(0.5,2.1)	0.990
Body condition							
Good		90	29(14.0)	1	0.010	1	0.432
Medium		87	16.(18.4)	2.4(1.2,4.9)	0.000	1.5(0.6,3.6)	0.000
Poor		207	32(35.5)	3.3(1.9,6.0)		4.8(2.2,10.9)	
Work	type	28	7(25.0)	1		1	
Cart		314	57(18.2)	1.5(0.6,3.3)	0.401	3.9(0.1,91.7)	0.723
	Draft	42	13(31.0)	1.2(0.4,3.7)	0.709	1.1(0.3,5.3)	0.919
Riding							
Season	January	64	3.0(4.7)	1		1	
		142	22(15.5)	1.5(2.2,3.5)	0.300	1.2(0.4,3.4)	0.730
December		50	11(22.0)	1.6(0.7,3.8)	0.334	2.4(0.7,8.2)	0.187
		64	20(31.3)	1.7(0.7,4.0)	0.203	2.4(0.8,7.5)	0.135
November		64	21(32.8)	0.9(1.5,21.9)	0.013	7.6(1.6,32.0)	0.012
	February						
	March						

4. Discussion

The overall lungworm infection prevalence of 20.1% recorded in the current study is in agreement with some of the previous reports. Different prevalence reports of *D. arnfieldi* were reported by various researchers from Ethiopia. [15] and [16] reported a prevalence of 20% in Bale and 23.2% in Wonchi district, respectively. However lower prevalence (13.80%) or lungworm infection was reported by [17] in and around Jimma town. These differences in prevalence might be due to differences in management practice favoring the survival of the larvae of the parasite and environmental conditions.

The prevalence of lungworm infection in horses (31%) was greater than in mules (24.1%) and donkeys (18.21%). The relatively higher prevalence in horses might be attributed to the difference in the purpose of these animals which means that in the study area most of the horses are used for riding (sport) purpose only during the Holy day and hence they pass most of their time grazing on fields which increase chance of acquiring infection than donkeys and mules. The other reason could be due to the lower number of samples in case of horses and mules in the current study may also affect the infection rate of these species. The prevalence report in horse in the current study is lower than the 38% prevalence of *D. arnfieldi* reported by [18] in Kentucky in horses. However, lower prevalence of 4.3% in horses of *D. arnfieldi* was reported by [17] and (10.4%) reported by [19] in Denmark. These differences in prevalence might be due to differences in agro ecology, management practice favoring the survival of the larvae of the parasite, and in environmental condition.

The present prevalence of lungworm infection in donkeys (18.21%) is agreement with report (16.2%) of [20] and higher than (3.6%) finding of [21] in and around Hawassa and (9.67%) reported by [22] in Turkey. But it was lower than previous findings of [23] who described a prevalence of 30.5% and 32.8% in Dire Dawa and other Eastern parts of the country,

respectively. [24] reported (32%) prevalence of *dictyocaulus arnfieldi* in donkeys in Dugda Bora District. [25] reported (42.8%) in donkeys of Sululta and Gefersa District. Higher prevalence of *Dictyocaulus arnfieldi* also reported in donkey by [11], [2] and [26] who recorded the value of 48%, 83% and 70.5%, Morocco, Ethiopia and Sudan, respectively. And extremely higher prevalence (87.5%) larva of *D. arnfieldi* in Denmark was found in donkeys by [19] and (51%) was reported from Netherland by [27]. These differences might be due to differences in agro ecology, season and sample size.

The present prevalence of lungworm infection in mule (24.1%) and was slightly lower than the 29.27% reports of [17] while it is slightly higher than the 20% prevalence reports by [28] in and around Bahir Dar. Similarly, a higher prevalence of lungworm was reported by [18] in donkeys and mules (54%) in Kentucky, USA. Lower prevalence of lung worm infection (7%) in mule was also reported by [3].

In this study the age animals was found as a major factor for variation in prevalence of lungworm infection. The highest prevalence (28.7%) was recorded in young (less than 5 years) and (20%) in old (more than 11 years) age groups. This might be related to the condition that older and younger animals are taught to have decreased immunity. Different levels of prevalence were observed in different body condition score. A prevalence of 35.5%, 18.4%, and 14% were recorded in poor, medium and good body condition scores respectively. Animals with poor body conditions are more susceptible to lungworm infection than animals with good body condition.

The significantly higher prevalence observed in males (24.6%) than in females (19.3%) observed by the univariate analysis could be due to the relatively higher work load for males than for females.

Concerning the seasonality of infection, in the current study it was found that the prevalence of infection was high in March (32.8%) and February (31.25%) than the rest of the study months. The environmental condition during these two months is relatively favorable due to the better rain availability while the rest months are not as they are relatively dry. Hence, during this adverse climatic condition larvae of lungworm prefer to inhabit in the lung tissue and mature at the beginning of the rainy season.

5. Conclusion and Recommendation

In general this study reveals the occurrence of highest prevalence of lungworm infection in horses when compared to that of mule and donkey. However, this difference was not found to be significant. Concerning the risk factors analysis, the lungworm infection was significantly higher among the young (< 5 years) and very old animals (> 11 years), among the animals with poor body condition and in months of March and February. Additionally, higher occurrence of lungworm was recorded among males than females and in kebele 3 based on the univariate analysis.

Based on the above conclusion the following recommendations are forwarded.

- 1) Attention should be given on the animals for the young and very old animals as they are more susceptible to the infection of lungworm. Hence, they should be dewormed and nourished well.
- 2) If possible the grazing field of donkeys and horses should be different
- 3) In general awareness should be created to the owners regarding the management system of equine.

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