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Ocuurrence of Lungworm Infection in Equines and Their Associated Risk Factors

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Abstract: This study was carried out to determine the prevalence of natural infections of lungworm, *Dictyocaulus arnfieldi (D. arnfieldi*) and to identify risk factors associated with it in horses, donkeys and mules in and around Jimma town, southwestern Ethiopia. A cross-sectional study design was used from October 2010 to March 2011. For this purpose, 384 faecal samples were taken from horses (n = 258), donkeys (n = 85) and mules (n = 41) and isolation of *D. arnfieldi* first stage larvae (L1) was performed using a modified Baermann technique. Infection rates were 4.3%, 35.3% and 29.3% in horses, donkeys and mules, respectively with the overall prevalence of 13.80% (53/384). More prevalence of lungworm infection was recorded in the age group of >10 years (22.9%) followed by the age group of =3 years (18%) and 4-10 years (10.98%). Observed prevalence of lungworms in female equines was 12.66% and in males was 18.80% with no statistical significant difference. In this study, animals with poor body conditions were found to be highly infested (50%) compared to medium (16.3%) and good body conditions (5.2%) with *P* value of less than 0.05. Hence, species of animals, age and body condition were found to be the important risk factors associated with equine lungworm infection.

Key words: *Dictyocaulus arnfieldi* · Equine · Jimma · Prevalence

INTRODUCTION

Ethiopia has 21.7 million horses, 5.57 million donkeys (second largest in the world next to China) and 380 thousand mules [1]. Equids (donkeys, mules and horses) play an important role as working animals in many parts of the world, for packing, riding, carting and ploughing. Equine power is very crucial in both rural and urban transport system. This is because of its cheapness and avaialbility 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 merchandise [2]. Even though mules 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]. Donkeys and their crosses (Mules) are the natural hosts for lungworm and the condition in horses is usually found in those that have been in the company of donkeys and mules [4]. *Dictyocaulus arnfieldi* is the true lungworm affecting donkeys, horses, ponies and zebras and is found throughout the world [5]. It is a relatively well adopted parasite of donkeys (*equus assinus*) but tend to be quite pathogenic in horses, where this parasite is endemic [6]. Other species of lungworms are also affecting the lungs of different domestic animals in Ethiopia [7].

Donkeys have been found to be the major host and most important reservoir for equine lungworms. They are considered to act as the source of infection; horses play only an ancillary role and become infected after pastured with donkeys [8-10]. In Ethiopia, about a prevalence rate of 20% [11] and 23.2% [12] were reported in mules and other equine species, respectively. However, there has not been any study done about lungworm infection of equines. Therefore, the aim of the present study was to determine the prevalence of equine lungworms in naturally infected horses, donkeys and mules in and around Jimma town.

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MATERIALS AND METHODS

Study Area: The study was conducted from October 2010 to March 2011 to determine the prevalence and associated risk factros of equine lungworm in and around Jimma town, Oromia National Regional State, southwestern Ethiopia. Jimma is located at 352 km southwest of Addis Ababa at an altitude of about 7013'- 8056'N and longitude of about 35052'-37037'E and at an elevation of ranging from 880-3360 meter above sea level. The area receives a mean annual rainfall of 1530 mm which comes from long and short rainy seasons. The annual minimum and maximum temperature were about 14.4°C and 26.7°C, respectively. The equine population of the area was found to be 1490 according to the reports of the Central Statistic Agency of the country [1].

Study Animals: Fecal samples were directly collected from the rectum of 384 equids (horses, donkeys and mules) of all age groups, body conditions and both sex groups. They were all local breeds, kept under extensive management system used for packing and transportation.

Study Design 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 the formula given by Thrusfield [13] at 50% expected prevalece 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.

Data Collection: Fecal samples were collected directly from the rectum using asterile glove and placed in air and water tight sample vials which was labeled accordingly and soon brought to the parasitology laboratory of Jimma College of Agriculture and Veterinary medicine. Fecal samples were processed on the day of collection and/or stored in a refrigerator at 4°C until processing. Coprological examination was performed using a modified Baermann technique for the detection of *Dictyocaulus arnfieldi* first stage larvae (L1) following standard procedures described by Soulsby, MAFF and Hansen *et al*. [14-16].

Data Management and Analysis: The data collected during sampling and laboratory results were entered in Ms-Excel spread sheet. Descriptive statistic was used to estimate the prevalence for *D. arnfieldi* in the study area. Risk factors such as age, sex and body condition were considered and their difference with infection was analyzed by chi-square. The statistical software SPSS version 17 was used for data analysis.

RESULTS

The results of present study revealed an overall prevalence of 13.8% of equine lungworm. The prevalence was found to be 35.29%, 29.27% and 4.26% in donkeys, mules and horses, respectively with statistical significance among them ($P < 0.05$).

It was also found that age and body condition status were significantly affecting the prevalence of equine lungworms. But, sex did not show any significant difference in the prevalence of lungworm infection. The relationship between body condition score and lungworm infection in equines was recorded to see the diffrerence in occurrences (Table 2). Significantly higher infection rate of 50% was observed in poor body condition group than minimum infection rates of 5.17% in good body condition groups.

DISCUSSIONS

The overall mean prevalence of lungworm infection in the study population was 13.8%. The prevalence of *D. arnfieldi* is also reported by different researchers from Ethiopia. Getahun [11] reported a prevalence of 20% and Shiferaw [17] reported a prevalence of 23.2% in Bale and Wonchi districts, respectively. This difference could be due to the difference in environmental conditions and management practice favoring the survival of the larvae of the parasite.

The infection rate was comparted among equine species and the highest prevalence was recorded in donkeys (35.3%). This was also true from the reports of Legese [18] who described a prevalence of 30.5-32.8% in Dira Dawa and Estern Ethiopia. On the contrary, Pandy [19], Feseha *et al*. [2] and Hassan *et al*. [20] had reported 48%, 83 % and 70.5% prevalences of *Dictyocaulus arnfieldi* in donkeys in Morocco, Ethiopia and Sudan respectively. Similarly, a higher prevalence of lungworm was reported by Lyons *et al*. [21] in donkeys and mules (54%) in Kentucky, USA. However, lower prevalences of 1.17%-1.73% in horses, 0.6%-14.6% and 9.67% in donkeys of *D. arnfieldi* were reported by Arslan and Umur [22], Ayaz [23] and Bakirci *et al*. [24] respectively. These differences in prevalence might be due to differences in agro-ecology, management systems, season and sample size.

Table 1: Mean prevalence of lungworm infection in different equine species

Species	Total examined	No. Positive	Prevalence (%)	P-value
Horse	258	11	4.26	0.000
Donkey	85	30	35.29	
Mule	41	12	29.26	
Total	384	53	13.80	

Table 2: Prevalence of lung worm infection at different risk factors

Risk factor	No of examined animals	No of positive animals	Prevalence	P-values
Age				
≤ 3 years	50	9	18.00	0.003
4-10 years	273	30	10.98	
> 10 years	61	14	22.95	
Body condition				
Good	232	12	5.17	0.000
Medium	104	17	16.30	
Poor	48	24	50.00	
Sex				
Male	308	39	12.66	0.192
Female	76	14	18.42	
Total	384	53	13.80	

The present prevalence of lungworm infection in mules (29.27%) was higher than previous findings of Esheta [12] who reported 20% prevalence of *D.arnfiledi* in and around Bahir Dar. But almost similar figure, 29.3%, has been reported by Clayton [25] and Klei [26]. However, Clayton [25] and Klei [26] also reported a higher prevalence of 50-80% in donkeys than the current study result. And exteremly higher prevalence (87.5%) of larvae of *D. arnfieldi* in Denmark was found in donkeys by Andersen and Fogh [27].

In the present study, the lowest infection rate was observed in horses (4.3%). This result is in agreement with that of Lyons *et al*. [21] with a prevalence of 2% in Kentucky, USA. But, the frequency of *D. arnfieldi* infection was proximately the same in the horses from donkey herds and in horses hospitalized due to chronic cough (10.4% and 8.8% respectively) in Denmark by Andersen and Fogh [27].

The age of animals was found as a major factor for the variation in the prevalence of lungworm infection. The highest infection rates (22.95% and18%) were recorded in old and young age groups, respectively. This might be related to the condition that older and younger animals are taught to have decreased immunity

In this study, different levels of prevalence were observed in different body condition scores. A prevalence of 50 %, 16.3% and 5.2% were recorded in poor, medium and good body condition scores respectively. Poorly nourished animals appear to be less competent in getting rid of infection although it is not unusual for well fed animals to succumb to the disease provided the right environmental conditions are made available [28].

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