Acta Parasitologica Globalis 12 (3): 41-48, 2021
ISSN 2079-2018

DOI: 10.5829/idosi.apg.2021.41.48

Prevalence of Equine Strongyles and its Associated Risk Factors in Digelunatijo Woreda, South East Ethiopia

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Abstract: A cross-sectional study was conducted from July to September 2021 to determine the prevalence of the major strongyles parasites in equines in selected kebeles (Sagure-mole, Cafa-gugesa and Buche-sillese) of Digaluna tijo woreda, South-East Ethiopia. Fresh fecal samples were collected from 384 randomly selected equines: horses (n=336), donkeys (n=48) and mules (n=7). Coprological examination for the detection of strongyles parasite eggs was performed using simple test tube floatation technique. The result revealed that the overall prevalence of strongyles parasite infection in all species of equines was found to be 82.3% (316). In each species, the overall prevalence was found to be 85.11% (286), 63.41% (26) and 57.14% (4) in horses, donkeys and mules, respectively. In the study area, 14.84% (57) of horses, 1.3% (3) of donkeys and 0.26% (1) of mules harbored two or more types of parasites. Statistically significant difference ($P<0.05$) in the prevalence of strongyles parasite infection among different species of equines was found. There was no significant association ($P>0.05$) of the prevalence of the parasites in different groups of age, sex, origins (kebeles) and body condition scores of the animals. In conclusion, the infection of strongyles parasite in equine is widely distributed in the study area. Therefore, public awareness creation to equine owners on proper de-worming, sufficient feed supply, shelter and minimizing extensive open grazing should be devised in addition to conducting further advanced studies on the problem to alleviate its negative impacts.

Key words: Ethiopia · Equine · Strongyles Parasite · Digelunatijo District · Prevalence

INTRODUCTION

The equine population of the world is estimated to be 122.4 (40 million donkeys, 15 million mules, 43.3 million horses and 24.1 million zebras) [1]. In the developing world, there are estimated 110 million of equines [2]. Ethiopia has about 7.9 million equines [3] and possesses approximately half of the Africa's equine population with 37% donkeys, 58% horses and 46% mules [4]. There is one equine for every four people in the agricultural sector and for every five persons of the total population [5].

Equines play an important role as working animals in many parts of the world, employed for packing, riding, carting and ploughing [6]. Equines have a prominent position in the agricultural systems of many developing countries [7]. Equines power in both rural and urban transport system is cheap and viable, providing the best alternative in places where the road network is insufficiently developed and the terrain is rugged and mountainous and in the cities where narrow streets prevent easy delivery of merchandise [6]. In Ethiopia, the low level of development of the road transport network and the rough terrain of the country make the donkeys and the horses the most valuable, appropriate and affordable pack animals under the small holder farming system [8].

Although equines are often described as hardy and resistant animals, they do suffer from a number of health problems [9, 10]. Parasitic strongylus are one of the most common factors that constrain the health and working performance of equines worldwide. Parasitic diseases have an economic impact on horses, donkeys and mules as they cause loss through lowered fertility, reduced work capacity and increased treatment cost [11]. They cause various degrees of damage depending on the species, number present, nutritional and the immune status of equids [12]. They decrease the performance, production and productivity in the animals mainly in the reduction of

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body weight or failure to gain weight or even increase the mortality in acute cases [13]. These diseases are also serious to the welfare of equines, causing pain in affected animals [14]. Among the helminthes, *strongyles* (large and small strongyles), *Trichostrongylus axei*, *Triodontophorus* spp., *Trichonema* spp., *Parascaris equorum*, *Anoplocephala* spp., *Dictyocaulus arnfieldi* and *Fasciola* species are the most known devastating parasites of equines [15].

A number of studies conducted to detect association between poverty and animal diseases identified gastrointestinal parasitism as one of the most important problems for equids in developing countries [16]. Infections of equines with gastrointestinal parasites are recorded from most countries of Africa and few parts of Ethiopia. In Ethiopia, few studies were done in central and eastern parts of the country [17]. The prevalence and type of internal parasites affecting equids, in general, are ubiquitous with equines being continually exposed throughout their lives. Although they are often heavily parasitized by helminthes, the prevalence and type of internal parasites affecting equids have not been determined to a great extent in Ethiopia [18]. Available information however, indicates that gastrointestinal parasites are the major cause of early demises of working donkeys and horses in Ethiopia [19]. Similarly that my research was conducted on the prevalence of equines strongyles parasites.

According to my information, a previous report on the prevalence of equine strongyles in Digelunatijo woreda has not been available. Therefore, this research was conducted with the objectives to determine the prevalence of equine strongyles parasites and to assess the risk factors associated with the prevalence of strongyles parasite infections in equines in three selected areas (kebeles) of Digelunatijo woreda, South-East Ethiopia.

MATERIALS AND METHODS

Description of Study Area: The study will be conducted in Digelunatijo woreda. DigelunaTijo is one of the woredas of Arsi Zone, in Oromia Regional state, Ethiopia. It has border with Lemuna Bilbilo on the south, Munesa on the southwest, Tiyo on the northwest, Tena on the northeast and on the east by Shirka districts. The administrative center of this woreda is Sagure; other towns include Tijo and Digelu. The District lying at 7°2'N39°15'E latitude with altitudinal range of 2500 to 3560 meters above sea level. The distance of Wereda from Addis Ababa is 198km. DigelunaTijo has a population density of 164.4/km^2 and total land area of 540km^2. The total population is 140, 466 of which 69, 503 are men and 70, 963 are women; 14, 080 or 10.02% of its population are urban dwellers [20]. Digeluna-Tijo has 23 Kebeles and 10 veterinary clinics. Total livestock population of the district are Cattle 251, 493; Sheep 134, 488; Goat 10, 830; Horse 26, 751; Donkey 18, 337; Mule 352, Poultry 81, 776 and Dog 4, 253 District Livestock Office).

Study Type and Study Animals: A cross-sectional study design was used to estimate the prevalence of strongylus parasites infections on fresh faecal samples of 336 horses, 41 donkeys and 7 mules, which were selected by simple random method from three selected areas (kebeles) of the Digelunatijo woreda. The study animals (especially the horses, mules and donkeys) were selected from all groups of age, sex and body conditions. These study animals were owned by the individual farmers of the district for the purpose of transportation and they were kept under extensive management system and were not treated with any anti-helminthics during the study period.

Sampling Method and Sample Size Determination: By using simple random sampling method and by considering 50% expected prevalence and 5% accepted error at 95% confidence interval, the sample size was calculated according to Thrusfield [21], using the formula: $N=1.96 * Pexp (1-Pexp)/d^2$; where, N=required sample size; Pexp=expected prevalence; d=desired absolute precision. $N=1.96^2 * Pexp (1-Pexp)/d$ $N=1.96^2 * 0.5(1-0.5)/(0.05)^2 = 384$ equines (336 horses, 41 donkeys and 7 mules) were considered for the study.

Method of Data Collection

Sample Collection: Before sample collection, any external abnormality (clinical sign), origin (kebeles), sex, age and body condition scores were recorded for each randomly selected individual animal. The age of the selected animals was determined from birth records/information obtained from the owners and by dentition based on Crane and Sevendsen [22]. Accordingly, equines were grouped into two age categories: animals less than 3 years of age were classified/grouped as young and animals greater than or equal to 3 years were considered as adult. Body condition score (BCS) was subjectively estimated and recorded based on the guides by NEWC [23] as poor, medium and good. Then faecal samples were taken directly from the rectum with strict sanitation using disposable gloves and put it in to universal bottles. Each sample was labeled with

animal identification (origin/kebele, species, sex, age and BCS) and then brought to Sagure Veterinary Clinic Laboratory.

Sample Processing and Examination: Samples were processed and examined on the day of collection . The samples were processed by simple test tube floatation technique (Annex 2) and diagnosis was done based on the observation of eggs of strongylus parasites in microscopic examination of the faecal sample. then the respective results were recorded.

Data Management and Analysis: The data collected from the study area were entered in to Microsoft Excel 2010 spread sheet and the data were coded appropriately and analyzed using SPSS version 20 statistical software. Descriptive statistics was analyzed and set as frequencies and percentage. Chi-square (x^2) tests were applied to test the statistical association exists among the associated risk factors such as origin of animals, species, sex, age and body condition scoring with that of the presence of the parasites.

RESULTS

During the study period, faecal specimens taken from a total of 384 equines (336 horses, 41 donkeys and 7 mules) were thoroughly observed/ examined for the presence of strongylus parasites. From the observed/examined animals, 286 horses, 26 donkeys and 4 mules were positive for strongylus parasites. The overall prevalence of strongylus parasites in equines of the study area was found to be 82.30% and there was a significant ($P<0.05$) association between equine species and the prevalence of the parasites (Table 1). In this study among the positives, 85.11% of horses, 63.41% of donkeys and 57.14% of mules harbored by strongylus parasite infection. Whereas 14.84% of horses, 0.78% of donkeys and 0.26% of mules harbored two or three types of parasites (mixed infections) (Table 2).

Regarding with the impact of the associated risk factors on the prevalence of the parasites, there is no significant association ($P>0.05$) between origin of animals and animal related factors with that of the prevalence of the parasites (Table 3).

Table 1: Overall prevalence of strongylus parasite in equines

Equine spp.	Number of Examined Animals	Number of Positive Animals	Prevalence (%)	χ^2 (P-value)
Horse	336	286	85.11	15.550 (0.004)
Donkey	41	26	63.41	
Mule	7	4	57.14	
Total	384	316	82.30	

Table 2: The frequency and percentage of each strongylus parasite in equines based on different associated factors:

Factors	Strongyle Frequency (%)	Mixed infection Frequency (%)	χ^2 (P-value)
Equine spp.			
Horse	54 (14.06)	57 (14.84)	18.670 (0.017*)
Donkey	5 (1.30)	3 (0.78)	
Mule	2 (0.52)	1 (0.26)	
Total	61 (15.90)	61 (15.90)	
Sex			
Male	29 (7.55)	29 (7.55)	1.540 (0.819)
Female	32 (8.33)	32 (8.33)	
Total	61 (15.90)	61 (15.90)	
Age			
Young	19 (4.94)	15 (3.90)	4.650 (0.325)
Adult	42 (10.93)	46 (11.97)	
Total	61 (15.90)	61 (15.90)	
BCS			
Poor	36 (9.37)	29 (7.55)	9.980 (0.266)
Medium	18 (4.68)	20 (5.20)	
Good	7 (1.82)	12 (3.12)	
Total	61 (15.90)	61 (15.90)	

*Statistically significant ($P<0.05$) and BCS is Body condition score

Table 3: Prevalence of strongylus parasite in equines based on different risk factors

Risk factors	Number of Examined Animals	Number of Positive Animals	Prevalence (%)	χ^2 (P-value)
Origin (Kebele)				
Cafa gugesa	120	103	26.92	9.460 (0.051)
Buchosillese	125	109	28.38	
Sagure mole	139	104	27.00	
Total	384	316	82.30	
Sex				
Male	188	151	39.34	2.180 (0.335)
Female	196	165	42.96	
Total	384	316	82.30	
Age				
Young	116	89	23.17	4.290 (0.117)
Adult	268	227	59.13	
Total	384	316	82.30	
BCS				
Poor	213	180	46.87	4.100 (0.392)
Medium	105	84	21.87	
Good	66	52	13.56	
Total	384	316	82.30	

BCS: Body condition score

Table 4: Prevalence of strongylus parasite in equine young and adult equines

	Horse		Donkey		Mule		
Parasites identified	Young (%)	Adult (%)	Young (%)	Adult (%)	Young (%)	Adult (%)	χ^2 (P-value)
Strongylus	28.86	60.65	3.27	4.91	0	3.27	0.330 (0.565)

Table 5: Prevalence of strongylus parasite in equine male and female equines

	Horse		Donkey		Mule		
Parasites	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	χ^2 (P-value)
Strongylus	42.62	45.90	1.63	6.55	3.27	0	1.560 (0.212)

Table 6: Prevalence of strongylus parasite in equines based on body condition scores

	Horse			Donkey			Mule			
Parasites	Poor	Medum	Good	Poor	Medium	Good	Poor	Medium	Good	χ^2 (P-value)
Identified	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
Strongyle	54.1	24.5	9.8	4.9	1.63	1.63	0	3.27	0	0.45 (0.978)

P- Poor body condition, Med- medium body condition, G- good body condition

Comparison of the prevalence using the two age groups of the animals revealed that the percentage prevalence of strongyles parasite was to be higher in the adult equines than the percentage prevalence of the young (Table 4). In sex-wise analysis prevalence was higher in female horses and donkeys. Comparison of the prevalence using body condition scores of equines revealed that the percentage prevalence of strongyles parasite to be the highest in animals with poor body condition whereas the prevalence was to be the least in animals with good body condition. The prevalence of parasites were not statistically significant (P>0.05) between young and adult, male and female and among animals with different body condition scores.

DISCUSSION

In the present study, an overall of 82.30% prevalence of strongyles parasite with 85.11% in horses and 63.41% in donkeys and 57.14% in mules was obtained. This finding is higher than the findings reported as 5.73% (4.17% in horses and 5.83% in donkeys) in and around Dangila town, Northwest Ethiopia by Haimanot *et al.* [24], 72.7% (78.5% in donkeys and 63.7% in horses) in Hawassa town, Ethiopia by Tesfu *et al.* [25] and 29.79% (15.7% in horse and 37.48% in donkeys) in South Darfur state by Sawsan *et al.* [26]. Whereas, this report is less than the reports of Alemayehu [27] and Getachew *et al.* [28] from East shewa and Adaa-Akaki that revealed 100%

and 99% prevalence, respectively. The prevalence of the current study was also lower as compared with the results of Yoseph *et al.* [29], Mulate [30] and Ayele *et al.* [31]; 100%, 100% and 98.2% in donkeys of Wonchi, highland of Wollo province and Dugda Bora respectively.

In the current study, there is significant ($P<0.05$) association between equine species and the prevalence of the parasites (Table 1). In the contrary of this study, study conducted by Haimanot *et al.* [24] indicated that strongyle infection is slightly higher in donkeys than in horses, but no statistical significant difference ($P>0.05$) was observed within the two species. These differences in the prevalence of the parasites might be due to the difference in the study area or due to nutritional status of the animal in the respective study areas which can influence the level of immunity and facilitated the parasite infections. Additionally, it could be affected by de-worming strategy in equines, accessibility to veterinary clinic and and also it could be due to the sample size and sampling method differences [19].

In the current study, there was no significant difference in the prevalence of the strongylus parasite in the equines that originated from different origins (kebeles) of the study area (Table 3). This is similar with the finding of Getachew [32]. This condition could be due to the similarity in the agro-ecology of the study areas, epidemiology of the parasites and the management systems used for the animals.

In this study even though there was no significant difference ($P>0.05$) between the prevalence of the parasites between the young and adult animals, the highest prevalence of those strongylus parasite infestation was seen in the adult equines (Table 3). This finding disagrees with the work of Ibrahim *et al.* [19] and Haimanot *et al.* [24] that were done in Hawassa town and in Dangla town, respectively. But, it agrees with the work of Pal and Qayyum [33] For this, the probable reason may be due to waning body conditions and immunity. Compared to the young equines, the immunity of the old equines is low as they are frequently exposed to strongylus parasite , extensive work overload and undernourished conditions [33].

In sex-wise, female equines were found to have the higher infestation of parasites than their counterpart males (Table 4). This agrees with the work of [33] This might be female animals can have lower immunity due to gestation, lactation and related stresses [33]. However; no significant difference ($P>0.05$) was observed between the two sexes of equines. This might be due to the absence of gestation and lactation in the female animals. Generally, it is assumed that sex is a determinant factor that influences the prevalence of parasitism [34]. Regarding with the relationship of prevalence of the strongylus parasite and animals' body condition scores, even though, there is no statistically significant differences in the prevalence of the parasites among the different body condition scores, more prevalence of the helminth parasites was observed in animals with poor body condition than the animals with the medium and good body conditions (Table 6). This agrees with the reports of Ibrahim *et al.* [19]. This might be due to the increased land cultivation, which restricts animals on small communal grazing land and this allows animals for continuous exposure to the parasites[19]. The other reason might be associated with the fact that animals with poor body condition have waning immunity and as a result they could not resist the parasites burden when compared with animals of good body condition [33].

Regarding with the relationship of prevalence of the parasites and animals' body condition scores, even though, there is no statistically significant differences in the prevalence of the strongylus parasites among the different body condition scores, more prevalence of strongyles parasites was observed in animals with poor body condition than the animals with the medium and good body conditions (Table 7). This agrees with the reports of Ibrahim *et al.* [19]. This might be due to the increased land cultivation, which restricts animals on small communal grazing land and this allows animals for continuous exposure to the parasites [19]. The other reason might be associated with the fact that animals with poor body condition have waning immunity and as a result they could not resist the parasites burden when compared with animals of good body condition [33].

CONCLUSSION AND RECOMMENDATIONS

In this study, the prevalence of equine strongyles parasite were found in horses, donkeys and mules with an overall prevalence of 82.30%. This prevalence was relatively higher when it is compared with many of previous studies that were conducted in other areas of the country by different researchers. Species of equines was an important risk factor for the occurrence of strongylus parasites and horses were at the highest risk of infection among the equines. For such result, the management practices in general and the agro-ecology of an area have paramount significances. Since equines have crucial importance in the livelihood of many areas of Ethiopia, particularly for transportation purpose including in the current study area, the existence of highly prevalent strongyles is enough to cause enormous socioeconomic

loss through poor weight gain and reduced working ability in equines. Therefore, based on the above conclusion, the following recommendations are forwarded:

- Public awareness creation to equine owners on conducting proper de-worming programs, sufficient feed supply, provision of shelter to equines and on minimizing extensive open grazing practices should be devised.
- Further advanced and continuous studies should be done on the problem to alleviate its negative impacts.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude and sincere thanks to Livestock Development Offices of Digeluna-Tijo, especially Laboratory staff for their Cooperation of reagents, materials and for sharing their experience

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ANNEXES

Annex 1: Fecal specimen submission format

Date -------/-------/----------
Sample ID/No _____

1. Name of the Owners _____ Address _____
2. Origin of Specimen/animal
Zone_____ Woreda _____ Kebele _____ Animal Spp._____ Sex_____ Age_____ Body condition_____

Annex 2: Procedure of flotation technique used to overcome the eggs of strongylus Procedure:

1. Take 4gm of faces in to plastic container and grind in mortal using pistol.
2. Add 30-40 ml of flotation fluid and mix thoroughly.
3. Crushing of fecal sample with pistol and mortal to mix with flotation fluid.

4. Sieve using tea Steiner/ double layer of gauze in to container.
5. Place test tube on test tube rack and gently topped off with suspension leaving convex meniscus at top of the test tube.
6. Cover with cover slip the top of test tube and leave test tube for 15-20 minute.
7. Carefully lift cover slip and place it on clean slide.
8. Examine using compound microscope at 10-40xs.
Source: Aymour *et al*. (1992).