

# Epidemiological Study on Equine Gastrointestinal Helminth Parasites in Mekelle, North Ethiopia

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## Abstract

A cross-sectional examination of 384 fecal samples was conducted from July 2016 up to November 2016 to determine the prevalence of gastrointestinal helminth infections of equines in Mekelle, North Ethiopia. Out of total fecal samples examined 196 fecal samples were taken from horses, 164 from Donkeys and the rest 24 from Mules. The prevalence of gastro intestinal helminths was 41.6% as detected by coprological examination. Coprological examination revealed that the prevalence in horses was 33.7%, in donkeys 51.8% and in mules 37.5%. There is significant difference ( $p < 0.05$ ) in the prevalence of GIT helminth infection between the equine species. Coprological examination revealed 35.4% infection with *strongyle* followed by mixed infections (10.4%), *P. eqourum* (8.3%), *O. equi* (5.7%) and *Anoplocephala* species (4%). No significant difference ( $p > 0.05$ ) in prevalence of GIT helminth was noticed between sexes. However, a significant difference ( $p < 0.05$ ) was noticed between the age groups, between different body conditions, feeding status, history of colic and frequency of deworming. The study revealed that Equines in the study area are infected with a range of heminth, which are representatives of the important equine pathogenic parasites found in Ethiopia.

## Keywords

Gastrointestinal Helminthes, Equines, Prevalence, Mekelle, North Ethiopia

## 1. Introduction

The world's equine population reaches 98.3 million (40 million donkeys, 15 million mules, 43.3 million horses) [1]. The population of equines in Africa is known to be 17.6 million (11.6 million donkeys, 2.3 million mules and 3.7 mil-

lion horses) [2]. The number of equines in Ethiopia is estimated to be 8.4 million (2.75 million horses, 5.02 million donkeys, and 0.63 million mules) [3]. Equines in Ethiopia are vital for transportation, field operation and post-harvest activities. History tells donkeys and mules have been the most utilized animals for all manners of draft purpose [4]. Therefore, equines are extremely important animals in Ethiopia agriculture and in national economy [3].

Though equines are described as resistant animals, they suffer from various health problems [5] [6]. Gastrointestinal (GIT) parasites are known for their economic impact on equines as they cause reduced fertility, loss of work power and cost of treatment [7]. Previous studies indicated that helminth parasites are major health hazard, limiting the overall performance of equines. Among the helminthes, strongyles (large and small strongyles), *Trichostrongylus axei*, *Triodontophorus* species, *Trichonema* species, *Parascaris equorum*, *Anoplocephala* species, *Dictyocaulus arnfieldi*, and *Fasciola* species are the most common devastating parasites of equines [8]. Parasites have a variety of effects on host ranging from no apparent ill effect to severe tissue destruction and death. The severity of infection depends on the pathogenic potential of the individual parasite species, the number of parasites involved, the age and immunity of the host, and the duration over which the infection is obtained [9]. Previous studies indicated that the prevalence and type of internal parasites of equines have been determined to a great extent in Ethiopia. Moreover, available information indicated that gastrointestinal parasites are the major causes of every demises of working equines in Ethiopia [10]. However, in the study area there was no detail current study on the prevalence of these parasites and their associated risk factors. Therefore, the **objectives** of this study were:

- To determine the prevalence of GIT helminth parasites of equines in the study area
- To identify the common GIT helminth parasites of equines
- To identify the risk-factors associated with Gastrointestinal parasitism

## 2. Materials and Methods

### 2.1. Study Area

The study was conducted from July 2016 up to November 2016 in Mekelle which is the capital city of Tigray regional state, Ethiopia. Mekelle is located 783 km north of Addis Ababa which is geographically located at 30°32' north latitude and 39°28' east longitude. Mekelle lies in the altitudinal range of 2000 to 2270 meter above sea level and its weather condition is mild (weyna dega) covering an area of 3500 hectares. The mean annual rainfall is 579 to 650 mm with temperature fluctuation between 11.4°C to 26.73°C. The rain fall is characterized as bi-modal type with short rainy season occurring from March to May and long rainy season from June to August followed by the dry season from middle of September to February [11].

## 2.2. Study Population

According to Mekelle city plan preparation project (2015) the population size of Mekelle is 248368 and based on Mekelle city finance and economic development, the total livestock population reaches up to 105934 in 2008, out of which the registered cattle population is 36516, shoat 8442, poultry 53796, Donkeys 3080, horses 800, mules 200, camel 100, and dogs 3000. It includes both exotic and local breeds of animals but the existing equine species are almost extensively local. Of the above populations of animals the study was conducted on equine populations which exist in Mekelle town. The equine species examined for the presence of any GIT helminth parasite include horses, mules and donkeys. The study includes both sexes male and female and also includes age range from 2 months of age to 14 year.

## 2.3. Study Design

Across-sectional study was conducted to determine the prevalence of GIT helminth parasites of equines existing in the study area. Households owning equine in the study area were randomly selected and a systematic random sampling technique was employed to select the sampling animals.

## 2.4. Sampling Method and Sample Size Determination

During the study time 384 fecal samples were collected directly from the rectum of the animals or sometimes from freshly defecated feces if the animals were seen defecating. Fecal samples were collected from randomly selected animals in the district. The age of the selected equines was determined by dentition [12] and body condition scores (BCS) were estimated based on the guides published by Svendesen [10]. The animals were categorized in to three based on body condition *i.e.* with BCS 1 - 3 as poor, BCS 4 - 6 as medium, and BCS 7 - 9 as good. Equines under two years of age were classed as young, those in range of two to ten years were classed as adults and those beyond ten years were classed as old. This way of age classing was based on age of first work, productive age and the life span of Ethiopian equines [10] [13]. The sample size was determined by the formula stated in Thrustfiled [14] with 95% confidence interval and 5% of absolute precision and considering that expected prevalence is 50% as there was no indication of previous study.

$$N = \frac{1.96^2 [P_{exp}(1 - P_{exp})]2}{d^2}$$

where,  $N$  = sample size

1.96 = the value of  $Z$  at 95% confidence interval

$P_{exp}$  = expected prevalence (50%)

$d$  = desired absolute precision (5%)

Therefore, by substituting the values of the variables in the formula the sample size was determined to be 384.

## 2.5. Data Collection

Fecal samples were collected from rectum of the animal wearing plastic glove and then taken to Mekele university parasitology laboratory with in a sampling bottle under the preservation of 10% formalin. During sampling: date of sampling, species of animal, origin, sex, and animal code were properly labeled. Then samples were either examined immediately or preserved inside +4°C refrigerator till examination. Information related to body condition, species, sex, age, history of colic, frequency of deworming, treatment history, purpose and feeding status of the sampled animals were properly recorded.

## 2.6. Coprological Examination

The collected fecal samples were examined by using standard floatation and sedimentation techniques simultaneously. Each sample was examined simultaneously by both techniques. The presence of at least one parasite egg in either of the tests revealed that the result positive. The egg morphology, appearance, size, color and presence of blastomeres were used to identify the parasites.

## 2.7. Data Analysis

Finally, data of the Coprological examinations were summarized using Microsoft excel spread sheet and analyzed by using STATA 11.1. The chi-square ( $\chi^2$ ) test was used to assess the difference in the frequency of GIT helminth parasites among different variables.

## 3. Result

Coprological examination of 384 equines revealed that 160 of them were positive for GIT helminth parasites. The prevalence in horse was 33.7%, in donkey 51.8% and in mules 37.5%. The highest prevalence was recorded in donkeys followed by mules then horses (**Table 1**). The prevalence of detected parasites was described as *strongyle* 35.4%, *P. eqourum* 8.3%, *O. equi* 5.7%, *anoplocephala* 4% and mixed infections 10.4%. The prevalence of strongyles was receded as the highest prevalence of the study (**Table 2**). The occurrence of two or three parasites (mixed infection) was also recorded. In this case the simultaneous occurrence of *Strongyle* & *P. eqourum* revealed higher prevalence (3.6%) (**Table 3**). The species, age, body condition, feeding status, frequency of deworming of the animals were the possible risk-factors for equine GIT parasitism in the study area.

## 4. Discussion

The overall prevalence was 41.7% which was lower than the previous reports in other parts of Ethiopia. For example, Yoseph *et al.* [15], Fikru *et al.* [16], Gizachew *et al.* [17], Ayele *et al.* [13] and Berhanu *et al.* [18] and Ismail *et al.* [19] reported prevalence between 97% - 100%. The current lower prevalence compared to the previous reports was due to the regular deworming habit of the cart horse owners, as 139 (36.2%) of the equines examined had deworming history.

**Table 1.** Prevalence of gastrointestinal helminth parasites and Chi-square analysis.

Risk factor	Animals sampled	Positive animals	Prevalence (%)	X <sup>2</sup>	P-value
Species				12.29	0.002
Horse	196	66	33.7		
Donkey	164	85	51.8		
Mule	24	9	37.5		
Sex				3.57	0.059
Male	299	117	39		
Female	85	43	50.6		
Age				15.25	0.00
Young	35	25	71.4		
Adult	279	112	40		
Old	70	23	32.9		
Body condition				66.18	0.00
Good	154	25	23		
Medium	106	29	45		
Poor	124	48	66.9		
Feeding				19.5	0.00
Stall fed	230	78	33.9		
Grazing	21	16	76		
Both	133	66	49.6		
Deworming frequency				26.82	0.00
0	243	136	55.5		
1	68	20	29.4		
2	47	4	8.5		
3	24	0	0		
History of colic				6.86	0.009
Yes	162	80	49.4		
No	222	80	36		
Total	384	160	41.7		

**Table 2.** Types of gastro intestinal helminth parasites detected in coprological examination.

	No of positive animals	Prevalence (%)
<i>Strongyle</i>	136	35.4%
<i>P. eqourum</i>	32	8.3
<i>O. equi</i>	22	5.7
<i>Anoplocephala</i>	16	4
Mixed	40	10.4

**Table 3.** Prevalence of mixed infections of GIT parasitism.

	No of positive animals	Prevalence (%)
<i>Strongyle &amp; O. equi</i>	9	2.3
<i>Strongyle &amp; Anoplocephala</i>	8	2
<i>Strongyle &amp; P. eqourum</i>	14	3.6
<i>P. eqourum &amp; O. equi</i>	3	0.78
<i>Strongyle, Anoplocephala &amp; O. equi</i>	4	1
<i>Strongyle, P. eqourum &amp; O. equi</i>	2	0.5

However the presence of important helminth parasites was proved in the study area. The study revealed that there was higher prevalence in donkeys and the difference in prevalence between equine species was statistically significant ( $p < 0.05$ ). This was in agreement with Mezgebu *et al.* [20], Regasa and Yimer [21] and Melkamu [22]. The difference in prevalence could be due to management differences in the area because most of the horses in the area were better managed than donkeys.

Though the prevalence was higher in females than males the difference was not statistically significant ( $p > 0.05$ ) and this agrees with the work of Fikru *et al.* [16], Mezgebu *et al.* [20], Berhanu *et al.* [18], Tesfu *et al.* [23] and Belay *et al.* [24] who similarly reported non-significant difference. There was decrease in the prevalence of GIT helminthosis as the animals gets older and the prevalence was higher in young equines (71.4%) while the prevalence in adults and old equines was 40% and 32.9% respectively. The observed difference was statistically significant ( $p < 0.05$ ) which was in agreement with Fikru *et al.* [16], Regasa and Yimer [21], Tesfu *et al.* [23] and Mangassa and Tafese [25]. The observed difference could be due to a lack of immunity in younger population. This has been mentioned in literatures [26]. Upjohn *et al.* [27] revealed that there seemed to be an inverse association between age and intensity of strongyle infection, *i.e.*, as horses gets older, the odds of higher egg count are reduced.

Based on body condition of animals the prevalence was significantly higher ( $p < 0.05$ ) in those animals having poor body condition with the prevalence of 66.9%. This might be due to the effect of parasitosis on the body condition of animals. Body condition score was a good indicator of parasitic burden [13] and this was in line with the report of Fikru *et al.* [16], Regasa and Yimer [21], Berhanu *et al.* [18] and, Worku and Afera [28].

Higher prevalence was observed in grazing equines (76%) and the difference in prevalence between different feeding systems was statistically significant ( $p < 0.05$ ). This could be due to higher likelihood of grazing animals to be exposed to parasite from the pasture. Prevalence was also compared with history of colic between animals, and prevalence was significantly higher ( $p < 0.05$ ) in animals which had history of colic. Moreover, animals with history of deworming had lower prevalence than animals without history of deworming and the difference

was statistically significant ( $p < 0.05$ ) and this was in line with Mangassa and Tafese [25].

In the current finding the prevalence of *strongyle* was 35.4% which is consistent with the study of Spira *et al.* [29] in Pakistan, Seri *et al.* [30] in Khartoum Sudan; and Worku and Afera [28] with the report of 31.7%, 35.8% and 32.6% respectively. However the previous studies in Ethiopia by Ayele *et al.* [13], Gizachew *et al.* [17], Mulate [31], and Yoseph *et al.* [15] reported the prevalence of *Strongyle* higher than 99% which was by far higher than the current study. More over a previous report by Fikru *et al.* [16] and Molla *et al.* [32] indicated that the prevalence of *Strongyle* 92.8% and 64.61% respectively which was inconsistent with the current finding. The lower prevalence seen in the current study may be due to the fact that there is proper management (most are stall fed & dewormed regularly), that may reduce chance of infestation. The prevalence of *P. equorum* was 8.3% which is in agreement with the study in Khartoum Sudan by Seri *et al.* [30]. Prevalence of *P. equorum* in Ethiopia by Ayele *et al.* [13], Fikru *et al.* [16], Gizachew *et al.* [17] and Mezgebu *et al.* [20] was 50%, 17.1%, 50% and 66.67% respectively. Significant difference in the prevalence of *P. equorum* between age groups was reported by Zerihun [33] and Gebreab [34] in different areas of Ethiopia. *O. equi* was found with the prevalence of 5.7% and this agrees with Ayele *et al.* [13], Fikru *et al.* [16], and Gizachew *et al.* [17], which reported prevalence between 2% and 3%. The current finding was higher than the prevalence (1.8%) reported by Dersema [35]. *Anoplocephala* species of parasites were the equine tape worms detected in the area, and their prevalence was 4% which was comparable with Ayele *et al.* [13], and Gizachew *et al.* [17], who reported a prevalence of 7.4%. It was also in agreement with the study of Gower [36] in working horses of Poland. Moreover, mixed helminth infection of equines was observed with prevalence of 10.4% which indicated that poly parasitism was common finding.

## 5. Conclusions and Recommendations

A cross-sectional coprological examination was carried out to study the prevalence of equine GIT helminthosis from July 2016 to November 2016 in Mekelle. The study indicated that helminthosis was a common problem in the area. Though helminthosis was a common problem in the area it was found lower in prevalence as compared to other previous reports in other parts of Ethiopia. In the present study helminthes like *strongyles*, *parascaris equorum*, *oxyrus equi*, *anoplocephala* and mixed infections were detected. However the prevalence of equine trematodes was zero. At the same time the current study revealed that horses were well managed in the area, while donkeys were neglected. Moreover the species, age, body condition, feeding status, frequency of deworming of animals were the potential risk-factors for equine GIT parasitism in the study area. Therefore, with this conclusion the following points were recommended:

- Further study of each detected helminth species and monitoring of their dis-

tribution is essential to design a proper control program.

- Any intervention program should consider the factors which had an association with equine GIT parasitism.
- All equines require equal attention and awareness towards regular deworming program and use of antihelminthics should be in place.

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