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Prevalence Study on Gastroitestinal Tract Helminthiasis of Equine in and Around Gondar Town

Muluken Worku, Shimeles Abegaz*
School of Veterinary Medicine, Wollo University, P.O. Box, 1115, DesseiAmhara, Ethiopia

***Corresponding author**
Shimeles Abegaz

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Abstract: A cross-sectional study of gastrointestinal helminthes parasites of equine was conducted for 6 months from November 2013 to April 2014 in and around Gondar, to determine the prevalence and associated risk factors of helminthes parasites of equines. A total of 384 faecal samples (donkeys (n=238), horses and (n=146) were collected from randomly selected equine for coproscopical examination and 40 pooled samples for recovery of parasitic larvae were collected and processed in Gonder University *Veterinary Parasitological Laboratory*. The overall prevalence of gastrointestinal helminthes parasite was 97.4% (374/384) out of which, 28.12% were mixed infections, with the prevalence rate of 97.9% and 96.6% in donkey, and horse, respectively. Coprological examination revealed the existence of five species and four genera of helminthes parasite namely, Strongylus species 47.13 %, Cyathostomes 22.65% Trichostrongylus axei 8.07 %, Triodonthophorus species 6.77%, Parascaris equorum5.2 %, Oxyuris equi 3.12 %, Strongyloides westeri 1.56 %, Anoplocephala species 1.04 % and Gastrodiscus *species* 1.82 %. No significant variations($P>0.05$) in prevalence of helminth parasites were noticed in relation to species, age**,** body condition score and sex groups of equine, except in case of Parascaris equorum in which prevalence was observed to significantly decrease and increase with age, respectively ($P<0.05$). The average egg per gram of faeces in this study was 114.7 with a range of 100 to 5,500. The copro-culture study revealed that Strongylus vulgaris**,** Strongylus edentates and Cyathostomes were the major helminths larvae identified in the area during the study period. Generally parasitism and poly parasitism were the common finding of this work. Equine diseases in general, parasitism in particular, should be given attention in the region where equines are practically participating in all agricultural activities, from tillage to harvest.
Keywords: Equines, Egg count, GI helminths, Gonder, Prevalence.

INTODUCTION

There are an estimated 110 million equines (horses, donkey and mules) in developing worlds [1] where they provide considerable significance as power source, for transportation, cultivation and post-harvest activities in places where the road network is insufficiently developed [2]. Only few regions in North Western and South Eastern Ethiopia use equines for ploughing and threshing of crops is practiced [3] Ethiopia is believed to have the largest livestock population in Africa. There are about 1.91 million horses, 6.75 million donkeys, 0.35 million mules, and about 0.92 million camels in the sedentary areas of the country [4]. Among the horses aged 3 years and older, about 1.11 million were used for transportation, 0.20 million were for draught and the remaining 0.21 million were used for other purposes. With regard to donkeys, about 4.11 million were used for transportation whereas about 0.88 million and 0.19 million were used for draught and other purposes, respectively. Considering the purpose of the mules, 77.63% was used for transportation and very few were intended for draught and other purposes [4].

The livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country [4]. The equines [horse, *Equus ferus caballus*; donkey or ass, *Equus asinus*; Hinny (female)/ Mule (male), *Equus mulus* (synonym) *Linnaeus* 1758] are mainly use for the heavy work in the most of the mountain area as well as in the cities. Further, their most readily recognizable function against traction and draught in industry and agriculture that they have made the greatest contribution to human welfare and advancement [5, 6].

Parasitic diseases are the major obstacle in the growth and development of animal health all over the world [7, 8]. Gastro intestinal helminthes is one of the most important animal diseases worldwide that can cause heavy production losses in grazing animals. The disease is prevalent all over the world especially in

developing countries [9]. In horses and donkeys, nematodes are seen to be most prevalent, while cestodes and trematodes are less occurring as reported by Bakırcı, *et al.*, [10]. Horses, among most domestic animals are reported to be more susceptible to a large number of parasites and may harbor different species at any time [11]. Equines are infected with gastrointestinal parasites which show a rough with dull coat, weight-loss, stunted-growth, colic, weakness, diarrhea, dysentery and tail-rubbing. They die from heavy infections and even healthy looking equines die from internal damages due to gastrointestinal helminthes parasites [12].

The damage to organs is caused by migration of the parasite through the various tissues. Damage may only be temporary but sometimes permanent problems occur. Often tissue damage leads to invasion by foreign bacteria such as *Clostridiums*. Damage to tissues requires energy and protein to repair them, which diverts energy from production of meat and fats etc. Scarring from damage may reduce organ function as well. Due to the economic significance of gastrointestinal parasites, several millions of Dollars are spent annually on the control of these parasites worldwide. Despite this huge investment, gastrointestinal parasites still remains a major problem affecting the health and wellbeing of equine in different parts of the world [13]. Although there are large numbers of equines in the country with the great contributions to national economy, certain impediments hinder the maximum utilization of these animals to their potential. Some of these are the abundantly occurring infectious and parasitic diseases and the poor management system to these animals in the country [14].

In Ethiopia various studies disclosed that *strongyles*, *Parascaris equorum*, bot stomach worms, lungworms, tapeworms and liver flukes to be the most prevalent gastrointestinal parasites of equines [15]. Among gastrointestinal helminths, strongylosis is the most common diseases of horses throughout the world and cause death when control measures are neglected [16]. The disease process caused by strongyles can be produced by migrating larvae and by adult worms. Larval of *Strongylus vulgaris* are the most pathogenic, causing arthritis, thrombosis and thickening of artery wall [17]. In Ethiopia Equines are mainly found in highlands and middle altitudes. These altitudes are known by presence of fasciolosis and other parasitic diseases in livestock [2].

Regarding Epidemiological study on helminthosis of equines in the North Gondar highlands of Amhara region, no detailed similar work has been performed, prior to this study. Therefore the objectives of the present study were to determine the prevalence of gastrointestinal helminths of equines and assess the effect of putative risk factors on the distribution of these parasites.

MATERIALS AND METHODS

Study Area

Gondar town, the administrative center of North Gondar zone, found in the Amhara Regional State Northeast of Ethiopia, located 748 km away from Addis Ababa the capital city of Ethiopia. Geographical location of the study area is 35°7' N and 13°8' E and lies at an altitude of 2200 meter above sea level, with average temperature of 19.7°C. Districts experiences bimodal rain fall, short rain fall from March to May and long rainfall from June to September. Annual rain fall ranges from 880 to 1772 mm with a relative humidity of 23.9% to 79%. The zone is divided into three main agro-climatic zones: high land, mid land and low land region. The farming system of the study area is characterized by a mixed (crop-livestock production) farming system.

Study animals and design

A cross sectional study was employed to conduct the study. Equines considered in this study were local breeds in origin belonging to different age and sex groups. Young and adult groups were estimated using an age determination chart developed by Svendsen [18]. The age of sampled animals ranged from 2.5 to 14 years with an average of 5.5 years old. The body condition score was subjectively estimated based on guide published by Svendsen [18]. All the study animals did not receive anthelminthic treatment before and during the study period. Mules is not included in this study, this animal is not available in Gander town.

Sample size

A total of 384 faecal samples of horses and donkey were collected to examine for the presence of helminth ova and 40 pooled samples for recovery of third stage larvae. The sample size was determined using standard procedures as described by Thrusfield [19] for an infinite population, 50 % estimated prevalence, 95 % confidence interval and 5 % allowable error for the estimate.

Table-1: Number of Equines sampled based on age, body condition and sex

Animal		**Age**			**Sex**		**Body condition**		
	Number	Young	Adult	Old	Female	Male	Good	Medium	Poor
Horse	146	25	80	41	31	115	45	53	48
Donkey	238	51	116	71	123	115	76	76	86
Total	384	76	196	112	154	230	121	129	134

The study population in table 1 shows that most of the horses in the study area is used for cart pulling, (used as a transport for people and commodity) that is why the number of sampled female horses is significantly less than that of the number of male horses. Plus to that mule is not incorporate in this study, because this farm animal is not available in Gondar town.

Sampling Method

Faecal samples were collected directly from the rectum using arm length rubber gloves and placed in 28 ml glass, screw-corked universal bottles half filled with 10 % formaldehyde (samples for coproculture were collected without preservative). A floatation technique was used to concentrate the helminth eggs and microscopic examination of feces for helminth ova using procedures as described by Hendrix [20]. A quantitative fecal examination, for egg per gram of feces (epg) determination was conducted using a modified McMaster egg counting technique according to Hasson [21] to count helminth parasite eggs selectively on those samples positive for parasitic ova up on qualitative procedures. Additionally, 40-pooled fecal samples were collected and used to differentiate parasitic larvae whose eggs could not be distinguished by examination of fresh feces using a procedure described by Hendrix [20].

Data analysis

Raw data recorded was entered into Microsoft Excel spread sheet and analyzed using SPSS (17.0) statistical software. Based on the type of data, the association between risk factors and distribution of parasites were analyzed using bivariate and multivariate estatistical analysis of logistic regressions, the chi square test and analysis of variance Statistical significance was set at $P<0.05$ according to Thrusfield [19].

RESULTS

Overall prevalence

Eggs/larvae of different parasites were observed in both equine species under the study. From a total of 384 fecal samples examined, only ten of the samples were free of parasitic helminthes' eggs. On the other hand the overall prevalence of gastrointestinal (GIT) parasitic helminthes of equine in the study area was 97.39 (374/384) with the prevalence of 97.9%, and 96.6% in donkey and horse, respectively.

Table-2: Summary of the percentages of potential risk factors for the occurrence of GIT helminth parasite in Equine

Variables	No. of examined equine	No. of positive (%)	χ2	p-value
Species	384	374(97.4%)		
Donkey	238	233(97.9%)	0.625	0.429
Horse	146	141(96.6%)		
Sex	384	374(97.4%)		
Male	230	223(97%)	0.436	0.509
Female	154	151(98%)		
Age	384	374(97.4%)		
Young	76	73(96%)	0.839	0.658
Adult	196	191(97.4%)		
Old	112	110(98.2%)		
BCS	384	374(97.4%)		
Poor	134	134(100%)	11.809	0.003
Medium	129	127(98.4%)		
Good	121	113(93.3%)		

The chi-square analysis revealed the existence of significant difference in the occurrence of parasitic infection among body condition (x2=11. 809, Df= 2, $P<0.05$), whereas there is no significant difference ($p>0.05$) in the prevalence of gastrointestinal helminthes in equine species sex, and age groups (Table 2)

Coprological findings

The coprological examination in the present study revealed the existence of 9 different gastrointestinal helminthes of equine with different prevalence. The highest relative percentage was recorded for *Strongylus* (47.13. %, 181/384) followed by *Cyathostomes* (22.65%, 87/384), *Trichostrongylusaxei* (8.07%, 31/384), *Triodonthophorus*species (6.77%, 26/384) *Parascaris equorum*(5.2%, 20/384*). Oxyrus* (3.12%, 12/384), *Gastrodiscus species* (1, 82%, 7/384), *Strongyloides westeri* (1.56%, 6/384) and the list but not the last *Anoplocephala*species (1.04%, 4/384) (Table-3). Similarly, the highest rate of mixed infection was observed in case of S*trongylus and oxyrus* (10.15%, 39/374) followed by *Strongylus* and *Parascaris* (8.85%, 34/374), *Strongylus and stongloides* (5.46%, 21/374), strongylus, *Anoplocephala*species and *Strongyloides westeri (3.64%, 14/384)*.

Table-3: Prevalence of GI helminthes in Equine

Species of parasites	Number examined	Number of positive	Relative Percentage (%)
Strongylus species	384	181	47.13
Cyathostomes	384	87	22.65
Oxyrus	384	12	3.12
Triodonthophorusspecies	384	26	6.77
Strongyloideswesteri	384	6	1.56
Anoplocephalaspecies	384	4	1.04
Parascarisequorum	384	20	5.2
Trichostrongylusaxei	384	31	8.07
Gastrodiscus species	384	7	1.82
Total	384	374	97.39

Table-4: Prevalence of GI helminths in equine and mixed infection in relation to different risk factors inthe study districts

Risk factor	No. samples examined	Overall helminth ova		Mixed infection	
		No. positive	Prevalence %	No. positive	Prevalence %
Species	384	374	97.4	108	28.12
Donkey	238	233	97.9	68	28.57
Horses	146	141	96.6	49	27.39
Sex	384	374	97.4	108	28.12
Male	230	223	97	61	26.52
Female	154	151	98	47	30.51
Age	384	374	97.4	108	28.12
<4 year	76	73	96	45	59.21
4-8 year	196	191	97.4	31	15.81
>8 years	112	110	98.2	32	28.57
Body condition	384	374	97.4	108	28.12
Poor	134	134	100	49	36.56
Medium	129	127	98.4	37	28.68
Good	121	113	93.3	22	18.18

Accordingly, statistical analysis with SPSS 20 revealed that, the prevalence of each gastrointestinal parasite with respective categories of the risk factors in the study area is not significant difference ($p>0.05$), except body conditions ($P<0.05$) as it was seen in the above tables (5).

Table-5: Distribution of helminthes parasites of equine among different risk factors

Variable		***Strongylus***	***Cyathostomes***	***T. axei***	***Parascaris equorum***	***Triodonthoph orus***	**Anapelocepha la**	X^2	P-value
Species	**Donkey**	60.7%	55 %	83.8%	40%	34.6%	25%	15.136	0.57
	Horse	39.2%	44.8%	16%	60%	65%	75%		
	Total	47 %	22.6%	8%	5.2%	6.7%	1.0%		
Age	**<4years**	17 %	21.8%	25.8%	100.0%	7.6%	25%	11.17	0.799
	4-8 yr	52.4%	49.4%	51.6%	0.0%	69%	75%		
	8 years	29.8%	28.7%	25.8%	0.0%	23%	0.0%		
	Total	47%	22.6%	8%	5.2%	6.7%	1.0%		
Sex	**Male**	58%	58.6%	58%	5%	73%	100%	8.870	0.353
	Female	41.98%	41%	41.9%	95%	26.9%	0.0%		
	Total	47%	22.6%	8%	5.2%	6.7%	1.0%		
BCS	**Poor**	25.9%	29.9%	25.8%	25%	50%	25%	81.142	00.000
	Medium	35.3%	41%	25.8%	50%	30.7%	25%		
	Good	38.67%	28.7%	48%	25%	19%	50%		
	Total	47%	22.6%	8 %	5.2%	6.7%	1.0%		

Faecal egg counts

The average egg per gram (epg) of feces in this study was 114.7 with a range of100 to 5,500. These variations is due to difference in district, age, sex and bodyconditions were not statistically significant (P>0.05) (Table-3).

Table-6: Helminth egg per gram of feces (epg) counts in both horses and donkey in relation to different risk factors in the study area Table-3

Risk factor	No. of sample	Mean EPG out put	Standard deviation
Species	374		
Horse	141	105	22.67
Donkey	233	156	94.22
Age	374		
<4 years	73	140	55.18
4-8 years	191	106	54.54
> 8 years	110	95	26.81
Sex	374		
Male	233	101	49.46
Female	151	117	38.05
Body condition	374		
Poor	134	130	36.97
Medium	127	104	28.48
Good	113	96	12.64
Total	374	114.7	49.69

Differential larval counts

The copro-culture performed on 40-pooled fecal samples revealed three *Strongyle* genera, which were: *Strongylus vulgaris* 36.34 %, *Strongylus edentates 29.97* %, *Cyathostomes* species 24.54 % and *Triodonthophorus* species 9.15 % (Table-7).

Table-7: Result of differential larval counts recovered by coproculture from 40-pooled fecal samples from horses in the study areas

Species / Genus of larvae	No. larvae	Proportion
Strongylus vulgaris	1238	36.34
Strongylusedentatus	1021	29.97
*Cyathostomes*species	836	24.54
*Triodonthophorus*species	312	9.15
Total	**3407**	**100.00**

DISCUSSION

The results of the present study clearly depicted that helminthes infection are highly prevalent in equine of South Gonder Zone of the Amhara Region. Currently the overall prevalence of helminth parasites in equine was 97.39% in and around Gondar. This was more or less in harmony with the work reported by Yoseph, *et al.*, [15] Ibrahim *et al.*, [22], Ayele [23] with 100%, 96.9% and 98.2% in Wonchi, Dugda and Awi Zone respectively. The difference among these findings from different areas might be due to variation in management system, sample size, sampling method and geographical origins of the animals.

In this study nine different types of helminth parasites (4 at species and 5at genus levels), of which *strongylus* species 47.13%, *Cyathostomes* 22.65%, T.axi 8.07%, *P. equorum* 5.2%, *Triodonthophorus* 6.77%, were found to be the dominant helminth parasite in the study area. The current study is in agreement with the finding of Yacob *et al* (2013) who recorded, *strongylus* 39.5%, *Cyathostomes* 35.3%, *T.axei* 29.0 %, *P.equorum* 11.7%, *Triodonthophorus* 13.9% as the major helminth parasites in equine of Oromia zone. Other works in other parts of Ethiopia by Gebreab *et al*., [3] who recorded *Cyathostomes*in 85-92%, *Strongylus* species in 74 - 80 %, *Triodonthophorus* species in 74 - 78 %, *P.equorum* 38.4 - 44.7 % as the major helminth parasites in equines in central Ethiopia.

Mixed infections were detected in 28.12% of the equine which were more important in loss of body condition than the single infection. The present of more than one helminthes in equine may be related with lack of control measure for helmith parasites. Lack of seasonal deworming approach, might have attributed to the incidence of polyparasitism. When prevalence between the species was compared, there is no significant difference (p>0.05) when the prevalence of helminth parasite infection between donkey and horses, this might be due to feeding and deworming practices in the study area as the same time for both equine species.

The current study reveal the prevalence of *strongylus* (47.13%) and *Cyathostomes* species (22.65%) which is much lower compared to those

reported by Gebreab [2], he obtained *S.vulgaris* 80% and *Cyathostomes* 76.1% in equine in Dbre Zeit town. Similarly, Krecek *et al.,* [24] reported a prevalence of 94 % for *S. vulgaris* in horses of South Africa. In the present study, the reported prevalence was lower due to the fact that sampling was conducted partly in the dry season of the year. The prevalence of *Strongylus* type eggs in horses was 47.13% which is in poor agreement with 58.50% [7], and much lower than the work reported 91% by Ashenafi, *et al.*, [25].

The lower prevalence in the present study could be due to the fact that, all horses of this study were cart horses that are less exposed for parasitic diseases and in some cases totally restricted from pasture. The prevalence of *Strongylus* infestation was 44.2% in donkeys. Similar studies conducted in different parts Ethiopia indicated higher prevalence than the current study with an overall prevalence of 99%, 100%, in Ada, and Akaki, Getachew *et al.,* [26]. The lower prevalence in the present study could be due to seasonal variation causes egg desiccation, management or/and sample size.

In terms of *strongylus* species (47.13%) the present study was higher than the work of yacob *et al.*, [27] which obtained (39.5%) but in terms of *Cyathostomes* species (22.65%), the current study is lower than the work of Yacob *et al.,* (35.1%) [27].

The prevalence of *Trichostrongylus axei* (8.07) observed in this study was much lower than the work of Yacco *et al*., [27] which obtained (29.0%) and also lower than the work of Krecek *et al*., [24] and Gebrab *et al.,* [2]; which ranged from 25-40%. The prevalence of *Triodonthophorus* species in this study (6.77%) was also lower than the previous findings of Yacob *et al.*, [27] and Krecek *et al.,* [24] and Gebreab [2] who reported 13.9%, 23 % and 35 %, respectively. However it was higher than the finding of Reinmeyer *et al*., [28] which obtained 3.6%. This discrepancy is might be due to the season of sample collection, different in agro ecology, equine management system and very few sample size that we collect for our study.

The prevalence of P. equorum in the present study (5.2%) was much lower than the work of Mezgebu [29], reported 43.8% in Bahir Dar, Northwestern Ethiopia, Mulate *et al.,* [30], reported 33.8% in South and North Wollo zone and also lower than that of 15.7%, 7.3% and 11.7% reported by Yoseph *et al.,* [15] and Getachew *et al.,* [26] and yacob *et al.,* [27], respectively.

The prevalence of *P. equorum* was significantly higher in young horses (21.0 %) than older horses (9.1%). This was not unexpected because *P. equorum* is more of a problem of young horses as immunity develops following exposure during older age [20, 16]. Acquired resistance to *P. equorum* usually develops before the second year of life and therefore, cases are highly reported from younger animals [16].

Young animals were seem to more susceptible than adults. Gebreab [2] reported *Strongyliodes westeri* and *P. equorum* frequently blamed to affect young species of equines. The prevalence of *P. equorum* was also higher in mares (15.7%) than their counterpart stallions (9.5 %). This can be justified by the fact that mares have a close relation to their foals, which favors frequent recycling of the parasite between the dam and foal. Heavy infections of *P. equorum* cause impaction and perforation leading to fatal peritonitis [16].

*Oxyuris equi*was detected 13.9%, and 4.1% in donkeys and horses in the study areas, respectively, and this prevalence were lower than previously reported, 25.4% and 22.05% in donkeys and horses respectively [30]. The low prevalence in this study might be due to the effect of relative higher temperature in the present study area which desiccates the highly susceptible *Oxyuris equi* eggs. *Oxyuriasis* is not a serious disease, but intense irritation of the perianal region is annoying and may cause disfigurement of valuable animals [31].

The prevalence of *Anaplocephala* species was 0.4% and 2% in donkey and horse respectively. This low prevalence could be due to the seasonality of Orbited mites vectors [17]. The prevalence of *anoplocephala* species was low and that might be related to the fact that *anoplocephalide* eggs occur as a result of the disintegration of segments `outside the host and very rarely inside [3]. Similar results have been reported in the survey of helminth parasites conducted in the central high lands of Ethiopia [15, 30].

The prevalence of *Oxyuris equi*3.12% *Strongyloides westeri* 1.56%, *Anoplocephala* species 1.04% and *Gastrodiscus* species 1.86% is quite lower than previous reports by Yoseph *et al.,* [15]. However the current findings are higher than the work described by yacob *et al.,* [27] 1.8%, 0.7%, 0.3% and 0.2% respectively. *Anoplocephala magna* and other related but less common and smaller tapeworm such as *Paranoplocephala perfoliata* are the only adult cestodes found in horses [17]. This low prevalence of cestodes in horses in this study could be due to the seasonality of orbited mites (vectors) as described by Soulsby [17].

The prevalence of *strongyloides westeri* was 0.8% and 0.7% in donkey and horse respectively. In some cases, lowest prevalence of the GIT parasites may be recorded when there is relatively higher temperature in the area, which can result in the desiccation of their eggs. Furthermore, the effect of treatment can result in the lower occurrence of these parasites when there is deworming activities.

A relatively higher mean egg per gram of feces 156 epg output was observed in donkey than horses

105epg, this is because of the horses in this study is used for cart pulling and they always feed at home after work, otherwise donkey are used to graze freely during traveling here and there. This result was in agreement with findings of Krecek *et al.*, [24] and Barclay, *et al*., [32], who reported the spring rise of *Strongylus* egg output in grazing equine species. This is also attributed to the favorable condition of wet and humid environment to the biology of these parasites.

The differential larval count indicated that *S. vulgaris*, *S. edentates* and *Cyathostome* species were the major parasites of horses in the studied districts. This result is in line with the findings of Gebreab *et al.*, [2] and Yakob *et al.*, [27].

The results of the present study disclosed that poly-parasitism is one of the commonest ill-causing factors and the main cause of early demise of horses in the study districts. However, the problem due to gastrointestinal helminthes of equines in the study area was given less attention because of its sub clinical nature. Hence strategic treatment of equines should be undertaken on the basis of sound and complete understanding on the epidemiology of gastrointestinal helminths of equines in the study districts.

RECOMMENDATIONS

- Strategic treatment with appropriate, effective and broad spectrum antihelminthic should be practice at the beginning and after the end of rainy seasons. Such treatment regime is targeted to get rid of the parasites burden of the host animals and minimize pasture contamination by dropping feacal egg output.
- The government should formulate an appropriate policy regarding equines' management and health aspects without delay, and this should be hold in the livestock extension package programme.
- Additionally, the field veterinarians and stockowners should be aware of the importance and burden of helminthosis in equines.

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