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Prevalence of Gastrointestinal Parasites of Equines in and Around Gondar Town, Amhara Regional State, Ethiopia

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Abstract

Gastrointestinal parasites have an economic impact on equines due to treatment cost, reduction of productivity and work power. A cross-sectional study was conducted from November 2017 to April 2018 in and around Gondar town, northern Ethiopia to estimate the prevalence and associated risk factors of gastrointestinal parasite infestation. Fecal samples, from 147 randomly selected equine (96 horses and 51 donkeys), were collected and examined with direct smear, flotation and sedimentation techniques. 135 equines were positive for gastrointestinal parasites with 91.8% prevalence, of which 94.1% and 90.6% prevalence was recorded in donkey and horse, respectively. Occurrence of gastrointestinal parasites between horse and donkeys showed no significant difference ($p>0.05$). Fecal examination revealed 58.52% infection with Strongyles followed by mixed infection (27.41%) and *Parascaris equorum* (14.07%). Statistically significant difference was recorded in the occurrence of Strongyle spps between, donkey and horse ($p<0.05$), and purpose of keeping the equine ($p<0.05$). There was also statistically significant association in the prevalence of *Parascaris equorum* and purpose of keeping the equine ($p<0.05$). The prevalence of gastrointestinal parasites between age groups revealed statistically no significant difference ($p>0.05$). But, a statistically significant difference ($p<0.05$) was recorded between the sex; body condition and purpose of keeping equine. In the present study higher prevalence of gastrointestinal parasite infestation was noticed in equines particularly with Strongyle spp. and *Parascaris equorum*. Therefore, strategic prevention and control of gastrointestinal parasite infestation is very crucial in current study area.

Keywords: Equines; Gondar town; Strongylus; *Parascaris equorum*

Introduction

The global equine population is estimated about 98.3 million, of which 40 million are donkeys, 15 million mules, 43.3 million horses [1]. In Africa the population of equines is believed to be 17.6 million, among which 11.6 million are donkeys, 2.3 million mules and 3.7 million horses [2]. The population of equine in Ethiopia is known to be 11.01 million, out of which there are about 2.16 million horses, 8.44 million donkeys and 0.41 million mules [3].

Equines have an essential role particularly as working animals in many parts of the world including Ethiopia [4]. Working equine are very important for both rural and urban transport system because equine transport system, is cheap and provides the best alternatives in areas where the road construction is inadequate, as well as crowded roads which prevent easy delivery of automotive [5].

Gastrointestinal parasites (GI) infestation is the most significant problem in the area where equine rearing is common. Equines are very susceptible to several internal and external parasites. Among internal parasites of equine Strongyles, Ascarids, Oxyuris, Gastrophilus, paranoplocephala and lung worms are more prevalent [6,7]. It is therefore, crucial to understand the importance of parasites as part of routine equine health care. In equine parasite infestation without exhibiting any clinical signs is usual and they appear relatively healthy [8]. But the most common health constraint and loss of work performance in equines is associated with parasitic helminthes worldwide.

The effect of parasites on equines manifested as a sever destruction of tissue and death. The severity of parasitic complication depends on pathogenic potential of the individual parasite species, the number of parasites involved, the age and immune status of the host and duration of infection [9].

The most prevalent internal parasites affecting eqiuds are ubiquitous with equines being frequently exposed all over their lives [10]. The occurrence rate of equine GI parasites is varied in different parts of world under different management and parasite control systems [11-15]. In Africa there is high prevalence of GI parasite in equine. According to the previous report in different part of Africa the prevalence is ranging from 59.3% to 98.3% [16-19]. There is also high prevalence of GI parasite in Ethiopia. For example in northern part of the country the prevalence is ranging from 59.3% to 92.7% [16,20,21], in western part of the country the prevalence is 72.25% in Jimma [22] and 83.3% in Bale [23]; in eastern Ethiopia the prevalence is 75.62% [24] and in southern parts the prevalence is 72.7 and 100% in Hawassa Town and Damot-Gale district respectively [25,26]. Several study in different part of the country revealed the high prevalence of Strongyle spp, *Parascaris equorum, Oxyuris*, *Gastrodiscus aegyptiacus*, Tricuris and Anoplocephal parasites of which most commonly detected parasite is Strongyle spp followed by mixed infection and *Parascaris equorum* [20,22]. However, information regarding the prevalence and type of internal parasites affecting equines has not been recorded well in northern part of Ethiopia in general and in Gondar town in particularly. Therefore, the objectives of this study were to determine the prevalence of GI parasite infection of horses and donkeys in and around Gondar town and assess possible risk factors for the occurrence of GI parasitic infection in the study area.

Materials and Methods

Study area

The study was conducted in and around Gondar town, Amhara National Regional State, Ethiopia. Gondar town is located at 728 Kilometers far from Addis Ababa at an elevation of 2133 m.a.s.l. The city has a latitude and longitude of 12°36'N 37°28'E / 12.6°N 37.467°E. Rain fall varies from 880-1172 mm with the average annual temperature of 19.7°C. The area is characterized by two seasons, the wet season from June to September and dry season from October to May. The population of animals is known to be 3,666,360 cattle, 1,398,748 sheep, 1,947,196 goats, 31,385 horses, 18, 389 mules, 501,696 donkeys, 6,204,610 poultry and 452,129 beehives. The farming system in the area is Crop-livestock production in a mixed form [3].

Study population

The study population was indigenous breeds of horses and donkeys of all age groups which were kept under traditional management system for carting, transportation and crop cultivation. Accordingly sampling was taken from urban carting horses and rural mixed purpose horses and donkeys.

Study design

A cross-sectional study was conducted from November 2017 to April 2018 to determine the prevalence and potential risk factors of GI parasitic infection of equine.

Sample size determination and sampling method

The study areas were selected based on inadequate studies and not much works conducted previously. The sampled equines were selected by simple random sampling method to estimate the prevalence of equine GI parasite infections in and around Gondar town. During sampling, sex, age, body condition score and purpose of keeping the equine were recorded to assess and possible risk factors. All the study equines were local breeds, kept under traditional management system. According to Loch and Bradley et al. [27], the animals were grouped in to two age group; animals less or equal to three years of age were considered as young while those animals greater than three years of were included as adults. The body condition of equines was classified into poor, moderate and good based on Carroll and Huntington [28].

The sample size for this study were determined based on Mezgebu et al. [20], with 92.7% of prevalence, absolute desired precision of 5% at confidence level of 95%. The sample size was calculated according to the following formula by Thursfield [29].

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

Where, N=total number of sample size,

Pexp=Expected prevalence,

d=Absolute precision.

Therefore based on the above formula, 96 horses and 51 donkeys, a total of 147 horses and donkeys were included in the study.

Sample collection and laboratory procedure

Fresh faecal samples approximately 10 gm-15 gm were collected directly from the rectum of study animals wearing plastic glove, placed in labeled sampling bottles and then taken to University of Gondar parasitological laboratory for analysis. Then samples were either examined immediately or preserved inside +4°C refrigerator till examination. The collected fecal samples were examined by using standard direct smear, 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 is positive. The egg morphology, appearance, size, and color were used to identify the parasites egg [30].

Data management and analysis

The collected data was recorded and entered into Microsoft Excel spread sheet. Before subjected to statistical analysis, the data were thoroughly screened for errors and properly coded, finally statistical data analyses was performed using STATA version 11 software packages. Descriptive statistical analysis such as tables were used to summarize and present the output from the data collected. The prevalence of GI parasite infections were calculated as percentage by dividing total number of equines positive for GI parasitic infection to the total number of equines examined. Pearson chi square (χ^2) test was used to assess the existence of association between the GIT parasitic infections with different risk factors and to evaluate degree of association. For (χ^2) test, p-value<0.05 were considered as significant while p-value >0.05 considered as non-significant.

Results and Discussion

The overall prevalence

Fecal examination from the total examined equines (147), 135 (91.8%) was found positive for different parasites in the study area (Table 1).

	Result	Prevalence
Positive	135	91.80%
Negative	12	8.20%
Total	147	

Table 1: The overall prevalence of GI parasite.

Prevalence of GI parasite of equines: Species wise

Out of the total sampled horse and donkey 87 (90.6%) and 48 (94.1%) were positive for single or multiple types of GI parasitic eggs respectively. Relatively the highest prevalence was recorded in donkeys no significantly association was recorded in prevalence of GI parasite between donkeys and horses (Table 2).

Species	Number examined	Number of positive	Prevalence	χ2 (p-value)
Horse	96	87	90.60%	0.5419 (0.462)
Donkey	51	48	94.10%	

Total	147	135		

Table 2: Species wise prevalence.

Prevalence of GI parasite of equines: Age wise

Out of the total sampled young and adult equines, 30 (93.75%) young and 105 (91.30%) adult were positive for single or mixed parasitic eggs. Relatively similar prevalence of GI parasite was recorded with respect to age group which showed statistical no significant difference (p>0.05) (Table 3).

Age	Number examined	Number of positive	Prevalence	χ2 (p-value)
Young	32	30	93.75%	
Adult	115	105	91.30%	0.1997 (0.655)
Total	147	135		

Table 3: Age wise prevalence.

Prevalence of GI parasite of equines: Sex wise

From the total 78 male and 69 female examined 68(87.17%) and 67(97.10%) were found to harbor parasite eggs respectively. Significantly higher prevalence of GI parasitic infection in female was recorded than male (p<0.05) (Table 4).

Sex	Number examined	Number of positive	Prevalence	χ2 (p-value)
Male	78	68	87.17%	
Female	69	67	97.10%	4.8077 (0.028)
Total	147	135		

Table 4: Sex wise prevalence.

Prevalence of GI parasite of equines: Purpose wise

From the total 32 carting and 115 non-carting examined 81.25% and 94.75% were found to harbor parasite eggs respectively. Significantly higher prevalence of GI parasitic infection in non-carting animals was recorded than carting animals (p<0.05) (Table 5).

Purpose	Number examined	Number of positive	Prevalence	χ2 (p-value)
Carting	32	26	81.25%	
Non carting	115	109	94.75%	6.1152 (0.013)
Total	147	135		

Table 5: Purpose wise prevalence.

Prevalence of GI parasite of equines: Body condition wise

The study included 51 equines poor, 77 moderate and 19 good body conditioned. The highest infection rate (100%) was noticed in poor body condition with no animal free from parasite egg, followed by good body condition (89.47%) and moderate body condition (87.01%). There was significant association among the three body condition categories with GI parasite occurrence (p<0.05) (Table 6).

Body condition score	Number examined	Number of positive	Prevalence	χ2 (p-value)
Poor	51	51	100%	
Moderate	77	67	87.01%	7.0648 (0.029)
Good	19	17	89.47%	

Total	147	135		

Table 6: Body condition wise prevalence.

Frequency of parasitic species

From the total of 135 positive samples 79 (58.52%), 37 (27.41%) and 19 (14.07%) were Strongylus species, mixed infection and *Parascaris equorum* respectively. This result indicated the higher prevalence of Strongylus species followed by mixed infection and Parascaris (Table 7).

Spp of parasite	Number of positive	Percentage
Strongylus	79	58.52%
Parascaris	19	14.07%
Strongylus and Parascaris	37	27.41%

Table 7: Frequency of parasitic species.

Frequency of parasitic species with all risk factors

From the total of 135 positive samples Strongylus parasite was the most commonly detected GI parasite followed by mixed parasitic infection and Parascaris relatively with all risk factors (Table 8). There was statistically significant association both in species of equine and purpose of keeping equine for the prevalence of Strongylus parasite. There was also statistically significant association for the prevalence of Parascaris and mixed infection with purpose of keeping equine and species of equine respectively (Table 8).

			Strongylus		Parascaris		Mixed infection	
	Risk factors	Number of examined	Number of positive (%)	χ2 (p value)	Number of positive (%)	χ2 (p value)	Number of positive (%)	χ2 (P value)
Donkey	51	20 (39.22)	-0.01	8 (15.68)	-0.46	20 (39.21)	-0.01	
Age	Young	32	19 (59.37)	0.522	4 (12.5)	0.007	7 (21.87)	0.2358
	Adult	115	60 (52.17)	-0.47	15 (13.04)	-0.93	30 (26.08)	-0.62
Sex	male	78	36 (46.15)	3.848	14 (17.94)	3.72	18 (23.07)	0.3865
	female	69	43 (62.31)	-0.05	5 (7.24)	-0.05	19 (27.53)	-0.53
Purpose	Carting	32	9 (28.12)	10.79	11 (34.37)	16.72	6 (18.75)	0.8951
	Non carting	115	70 (60.86)	-0	8 (6.95)	-0.01	31 (26.95)	-0.34
Body condition	Poor	51	33 (64.7)	3.779	5 (9.8)	0.707	13 (25.49)	0.026
	moderate	77	37 (48.05)	-0.15	11 (14.28)	-0.71	19 (24.67)	-0.98
	good	19	9 (47.36)		3 (15.78)		5 (26.31)	

Table 8: Frequency of parasitic species with all risk factors.

Discussion

In tropical and sub-tropical areas of the world, GI parasites infection is the main disease which affects horses and donkeys [31]. This study revealed that GI parasite was an important infection of equines 91.8% over all prevalence. Consistent result was reported by different scholars in different part of the country ranging from 83.3% to 100% [20,21,23,25]. However the prevalence of GI parasite observed in this study was higher than the report of prevalence from different part of the country ranging from 24.6% to 73.2% [16,26,32-36]. The prevalence of the present study was relatively lower than the study conducted by Tilahun et al. [37], Hassan et al. [38], Wannas et al. [39],

Uslu and Guclu et al. [40] and Desie and Melese et al. [25] who reported 97.9%, 100%, 100%, 100% and 100% prevalence respectively. This difference in the occurrence of equine GI parasite in different parts of Ethiopia could be due to the variation in season of sample collection which affects the occurrence of the parasites. Access to grazing land, deworming implementation and provision of supplementary feed to these animals affect GI parasite prevalence as well.

Higher prevalence was recorded in donkeys (94.1%) than that of horses (90.6%) which is slightly similar with Regassa and Yimer et al. [33], Wubishet and Yacob et al. [21], Desie and Melese et al. [25] and Belay et al. [37] who reported 77.3%, 83.3%, 100% and 82.5% respectively and it was higher than Taye et al. [41], Shiret and Samuel et al. [16] who reported 51.8% and 59.3% respectively. The occurrence of GI parasite infection between species was not statistically significant (P>0.05) which means species are equally susceptible to be infected with GI parasites. This result disagreed with works of Sultan et al. [24] who reported significant deference (p<0.05) between species of equine in the occurrence of GI parasite in which high prevalence was seen in donkeys. This higher prevalence in donkey recorded may be due to donkeys are usually kept under poor management system than horse in the area.

The prevalence of GI parasite in equines was recorded higher in young (93.75%) than that of adults (91.30%), which were agreed with reports of Andarge et al. [22] and Wubishet and Yacob et al. [21], but disagreed with works of Sultan et al. [24] who reported higher prevalence in adult (61%) than in young (25.7%). The prevalence between the two age groups was statistically not significant (P>0.05) which was agreed with the report of Saeed et al. [42] and Tesfu et al. [26]. Being an adult or young is not matter to harbor the parasite. Low immunity development and exposure of younger population to GI parasites are usually associated with higher infection rate and severity of the disease [43].

In the present study the prevalence of GI parasite was recorded higher in female (97.10%) than males (87.17%). Similar findings was reported by Asefa and Dulo et al. [44], Singh et al. [45] and Francisco et al. [46] whose report was higher prevalence in female than males. However, Belay et al. [36] and Umar et al. [47] reported that higher prevalence of infection was recorded in male than females. Statistically significance difference (P<0.05) was recorded in the prevalence of GI parasite between sex which was agreed with the report of Saeed et al. [42]. The significance association in the prevalence of GI parasite between sexes might be due to almost all sampled carting horses in Gondar town were male and believed to be regularly dewormed and kept under a better management system because horses are the basis for owner's daily life. Most of rural equines are browsers and there are high opportunities to harbor the parasite.

The prevalence of GI parasite in equines was found to be higher in non-carting (94.75%) than that of carting (81.25%) and statistically significance difference (P<0.05) was recorded between the purpose of keeping equines. This may be due to that owners frequently deworm carting equines and provide them with supplementary feed but non-carting equines are spend more time on pasture and receive little attention from the their owner.

In the present study, the higher prevalence was recorded in animals with poor body condition than good followed by moderate body condition score. The prevalence was 100%, 87.01% and 89.47% in poor, moderate and good body conditioned equines respectively. Statistically significant difference was observed among different body condition score (p<0.05) which was agreed with the findings of Andarge et al. [22], Samuel et al. [48] and Francisco et al. [46], but disagreed with reports of Asefa and Dulo et al. [44] who reported no association (P>0.05) in the occurrence of GI parasite among body condition scores. Highest prevalence in equine with poor body condition is due to that parasite usually share nutrients and affects digestion and absorption process, which predispose equines for further infection and impair immune development [31].

In this study, the most prevalent parasite was Strongyle (58.52%) followed by other detected parasite eggs, which was consistent with the findings of several researchers in different part of Ethiopia [22,42,48]. But the present result was higher than the reports of Ashenafi et al. [49] and Disassa et al. [50], who reported 36.8% and 4.92% prevalence respectively.

The prevalence of *Parascaris equorum* was 14.07% which was in line with the findings in different areas of the country [22,51]. But higher than the study reported by Alemayehu and Etaferahu et al. [52] and Samuel and Berihun et al. [53], whose finding was 5.4% and 6.5% respectively. It was also lower than the study reported by Tilahun et al. [37] and Belay et al. [36] who reported 55.8% and 36.2% prevalence of *Parascaris equorum* respectively. Low prevalence of *Parascaris equorum* recorded in the present study might be due that most of sampled equines were adult. Equines at younger age are susceptible to parasite infection. As the age increase the infection rate begins to decline and the infection is extremely uncommon in adult [54-56].

The prevalence of mixed infection (both Strongyle spp and *Parascaris equorum*) was 27.41%, which was higher than the finding of Belay et al. [36] and Alemayehu and Etaferahu et al. [52] who reported the prevalence of 2.6% (in and around Kombolcha town) and 6.5% (in South Wollo Zone) respectively. It was lower prevalence than the report of Yadav et al. [57] (62.5%) in Jabalpur region.

Higher prevalence of GI parasite in the present study might be associated with poor management practice [58-60], whereas lower prevalence of some parasites might be due to sensitivity of diagnostic technique or difference in geographical areas [15,56].

Conclusion

Through equines significantly contribute to the existing rural and urban economy of nation received less attention GI parasite infestation. The current study revealed high occurrence rate of equine GI parasites in and around Gondar town with 91.8% overall prevalence. However equine trematodes were not detected. The most prevalent parasite was *Strongyle* spp followed by *Parascaris equorum* and mixed infection are most important one. The prevalence GI parasite of equine was significantly associated with sex, purpose and body condition score. Even though, equines are important animals in livelihood of the population, attention given to the parasitic disease so far has not been sufficient in this group of animals. In order to mitigate the problem associated with GI parasite infection of equines awareness creation among the community concerning the equine welfare, strategic parasitic control program and good management system is necessary.

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