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Gastro-Intestinal Parasites of Equines in Tiyo District of Oromia Region, Ethiopia

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Abstract: The present study was conducted in Tiyo district of Arsi zone in Oromia Regional State to assess gastro-intestinal (GI) parasites of equines by using quantitative and qualitative fecal analysis methods. A total of 400 fecal samples were collected from donkeys, horses and mules and examined for the presence of GI parasites. Accordingly, the overall prevalence of GI parasites in horses, donkeys and mules was found to be 70.21%, 42.57% and 40%, respectively. A cross sectional survey conducted to assess the extent and distribution of major GI-parasites species revealed poly parasitism as a major finding in these equine species. Majority of the animals were found harboring many GI-parasites like *Strongyles*, *Parascaris equoroum*, *Gastrophillus* larvae, *Trichonema spp*, *Fasciola*, *Anoplocephala* and *Paranoplocephala spp*. The quantitative faecal egg examination, using the logarithmic transformation to determine the egg excretion per gram of faeces, showed the mean egg output to be 865.28. Out of 222 faecal sample examined by MC master egg counting technique 13.06% and 37.84% were massively and highly infected, respectively. There is high significant difference observed ($P<0.05$) in prevalence of GIT parasite between equine species and also between adults and young; while these difference were insignificant ($P>0.05$) between the two sexes. Thus, the present study revealed that gastro-intestinal helminths are among the major health constrains of equines in the area demanding an urgent control measures.

Key words: Equine · GI Parasites · Prevalence · Tiyo District · Oromia

INTRODUCTION

Ethiopia is home to the oldest feral horse population in Africa and the only wild horses left in east Africa, the Kundudo. One of the oldest recorded breeds, the Oromo bloodlines come from Ethiopia & later spread along the coast of the Red Sea. They were first imported into England in 1861, where they quickly became prized for several of their unique characteristics. Arsi and Bale provinces of Oromia region are known with their densely populated equine population, mainly with Oromo breed horses [1]. More recent estimates have shown that Ethiopia possesses about 9 million equines that represent half of the Africa's equine population [2].

Equine have a prominent position in the agricultural and transport system as a draft, pack and riding animals. In a country like Ethiopia where there is less developed modern transport and communication service, the natural choice rests on the use of human and pack animals mode of transport as it has been the large in some parts of the world [3]. Only few regions in north western and south of Ethiopia use equines for ploughing (Tillage) and threshing of crops is practiced [4]. Despite their great role in the sector of transportation and agricultural economy of the country, the health management accorded to equines has been far below than that given to other livestock species [5].

Equines are also vulnerable to a variety of diseases of biological like endo-parasites dominated by gastro intestinal helminthes which are the serious health problem contributing to poor body condition, reduced work out, poor reproductive performance and short life span. However, the greatest losses are probably failure of young equines to grow properly and less efficient performance of horses that are moderately parasitized [6, 7]. Large number of internal parasites has been identified in study conducted in some African countries including Ethiopia, Kenya, Zimbabwe, Burkina Faso and Morocco [8]. In Ethiopia, various studies disclosed that Strongyles, *Parascaris equorum*, Gastrophilus, lungworms,

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tapeworms and liver flukes to be the most prevalent gastrointestinal parasites of equines [9]. Some of the previous works also recoded the status of GIT parasites in different parts of the country with various level of occurrence rate. Thus, it was reported that the prevalence of endo-parasites of equine in Sululta and Gefersa districts of Central Ethiopia with 99.5% Strongyles, 53% *Parascaris equorum*, 9,8% *Fasciola* species, 5.7% *Gastrodiscus aegypticus* and 2.8% *Anoplocephala* species [10]. According to Getachew *et al.* [11] the prevalence of GIT parasite in Ethiopia with the prevalence of 99% *Strongylus* spp, 80% *Fasciola* spp, 51% *Parascaris equorum* and 8% Tape worm. Although some of the above-mentioned findings are recorded in the country so far, scarce information is available especially in the current study area. Hence, this research work was designed with the objectives of estimating the prevalence of equine GIT parasites, estimating the level of infection based on the count of eggs per gram of faeces and assessing the associated risk factor of the equine GIT parasites.

MATERIALS AND METHODS

Study Area: The present study was conducted from October 2013 to April 2014 in Tiyo district of Arsi zone in Oromia Regional State, Ethiopia. Tiyo district, which comprises Asela town, the town of Arsi zone is located 175km south east of Addis Ababa located at 6059' and 8°49'N latitude and 38°41' and 40°44'E longitude with an altitude ranging from 1650-3000 meters above sea level and the surrounding peasant association like Iteya that covers a total area of 300.21 km^2. Asela has a mild subtropical weather with an average annual temperature ranging from 10-22.6°C and minimum temperature of 10°C. The area has annual rain fall that ranges from 700-1658 mm and annual average relative humidity ranging from 43-60%. The area has a bimodal rain fall occurring from March to April (A short rainy season) from July to October (Long rainy season). Arsi zone is known for its various types of vegetation cover. Equine population is the highest in Oromiya region mainly of the Arsi-Bale highlands [12].

Study Animals: Animals considered in this study were equine species (Horses, mules and donkeys) of different age, sex and local breeds in origin. Young and adult groups were represented in each species and age of the animals was according to [13]. The age of sampled horses ranged from 3to 25 with an average of 10.5 years old. All horses were kept under typical traditional management conditions and allowed to graze without or poor supplementation (Crop residues) and did not receive anthelminthic treatment before and during the study period. Female and male groups also represented in each species. In addition, to this, examined horses were grouped in to urban (Taxi) horses and rural horses based on place of origin.

Study Design: A cross sectional study design was employed to identify, assess and determine the prevalence of major GI parasites of equines in and around Asela. Study animals were randomly selected from respective villages of Tiyo district. A total of 400 equines (132 horses, 158 donkeys and 110 mules) were used in this study. The sample size was determined using standard procedures as described by Thrusfield [14] for an infinite population, 50% estimated prevalence, 95% confidence interval and 5% allowable error for the estimate. Based on this formula, the sample sized was supposed to be 384 animals. However, in order to increase representativeness of each equine species, the number was increased to 400 then the number of equine species was proportionally reallocated based on the population size of each species in the study area.

Faucal Sample Collection: The faecal samples were collected from equines (Horse, mule and donkey) of randomly selected village in Tiyo district. 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). Each sample was labeled with the animal number and species corresponding to owners name, date and place of collection with inedible pen. The samples were transported to Asela Regional Veterinary Laboratory for further processing. All faecal samples were grossly examined for the presence of parasites. Faecal examination was done by different qualitative and quantitative faecal examination techniques.

All collected faecal samples were processed using the simple flotation technique with NaCl solution Zajac *et al.* [15]. A qualitative and quantitative faecal examination was made to search for nematode eggs and to determine the level of infestation. The eggs of different nematodes were identified using keys given by Taylor *et al.* [16]. The faecal egg count (Eggs/gm) was considered as a quantitative indicator of infestation level and it was determined by a modified McMaster technique,

where 2 g of faeces was mixed in 28 ml of saturated NaCl solution with a lower detection limit of 50 eggs/gm of faeces MAFF [17]. The level of infestation was determined according to procedure described by Zajac and Conboy [15] as none, mild (<500 egg per gram (EPG)), moderate (500 –1000 EPG) and high (>1000 EPG).

Additionally, 80 pooled fecal samples were collected and used to differentiate parasitic larvae whose eggs could not be distinguished by examination of fresh faeces using a procedure described by Krecek *et al*. [19]. Third (L_3) stage larvae of *Dictyocaulus arnifield* were recovered by using modified Baerman technique according to methods described in MAFF [17].

Data Analysis: Collected data was subjected to SPSS 11.5 software of the computer program for the statistical analysis. Based on the type of data, the association between risk factors and distribution of parasites were analyzed using bivariate and multivariate statistical analysis of logistic regressions, the chi square test and analysis of variance. The strengths of associations were determined using estimates of odds ratio. Statistical significance was set at P<0.05 according to Thrusfield [14].

RESULTS

The overall prevalence of GI parasites in horses, donkeys and mules was found to be 77.3%, 42.57% and 40%, respectively (Table 1).

A cross sectional survey conducted to assess the extent and distribution of major GI-parasites in equine species in and around Asela revealed poly parasitism as a major finding in equines. Majority of the animals were found harboring many GI-parasites like Strongyles, *Parascaris equoroum*, *Gastrophillus* larvae, *Trichonema*, *Fasciola*, *Anoplocephala* and *Paranoplocephala*. The prevalence of these parasites was indicated in the following Table 2.

From a total of 50 (25 horses, 15 donkeys and 10 mules) randomly taken fecal samples in and around Asela were subjected to modified Baerman technique to recover larvae of lung worms. Accordingly, *Dictyocaulus arnifield* was recovered in 9 (36%), 4 (26.67%) and 1 (10%) horses, donkeys and mules, respectively with an overall prevalence of lung worms in the three equine species found to be 28%.

From a total of 50 young equine species (32 donkeys, 25 horses and 3 mules), the prevalence of GI parasites was found to be 75%, 88% and 66.67%, respectively (Table 4).

Table 1: Overall prevalence GI parasites in Horses, donkeys and mules in Tiyo district

Species of equine	No of examined animals	No of positive animals	Prevalence
Horse	132	102	77.3%
Donkey	158	56	35.4%
Mules	110	64	58.2%
Total	400	222	55.5%

X^2= 32.137, P<0.05 and df = 2

Table 2: Prevalence of major GI parasites of equines (N = 400) in Tiyo district

Parasites	No. of positive animals	Prevalence
Strongyles	219	54.8%
Parascaris equoroum	97	24.3%
Gastrophillus	23	5.8%
Trichonema	37	9.3%
Fasciola	10	2.5%
Anoplocephala	9	2.3%
Paranoplocephala	5	1.3%

Table 3: Overall prevalence of the GI parasites recovered from the two age groups and between equine species from Tiyo district

Equine species	Total animal examined		Number of positive animal		Prevalence	
	Young	Adult	Young	Adult	Young	Adult
Donkey	32	156	24	108	75%	69%
Horse	25	177	22	64	88%	36.16%
Mules	3	7	2	3	66.6%	42.88%
Total	60	340	48	175	80%	51.47%

X^2 = 18.24, p<0.05, df = 1

Table 4: Overall prevalence of the GI parasites recovered from both sex groups among equine species from Tiyo district

Equine species	Total number of examined		Number of positive animals		Prevalence	
	Female	Male	Female	Male	Female	Male
Donkey	82	106	62	70	75.61%	66.04%
Horse	45	157	20	66	44.44%	42.04%
Mule	4	6	2	3	50%	50%
Total	131	269	84	139	64.12%	51.67%

X2 = 5.18, P> 0.05, df = 1

Table 5: Overall prevalence of GI parasites in rural and urban horses from Tiyo district

Site	No. examined animals	No. Positive animals	Prevalence
Rural	97	51	52.58%
Urban	105	35	33.33%
Total	202	86	42.57%

Table 6: Helminth egg per gram of feces (epg) in donkeys, horses and mules from Tiyo district

		Epg count			
Species	No. of animals examined	Low <500 epg	Medium 500-1000 epg	High 1000-2500 epg	Massive > 2500 epg
Donkey	152	12 (4.09%)	46 (34.85%)	54 (40.91%)	20 (15.15%)
Horse	86	12 (13.95%)	36 (41.86%)	29 (33.72%)	9 (10.47%)
Mule	4	1 (25%)	2 (50%)	1 (25%)	-
Total	222	25 (11.26%)	84 (37.84%)	84 (37.84%)	29 (13.06%)

df=2, P<0.005, X^2= 36.83

Table 7: Result of differential larval counts recovered by coproculture from 80 pooled fecal samples from horses in the study areas

Species/Genus larvae	No. of Larvae	Proportion
Strongylus vulgaris	3446	43.08%
Strongylus edentatus	2290	28.63%
Cyathostomes species	1655	20.69%
Triodonthophorus species	609	7.6%
Total	8000	100

Out of a total of 340 adult equine species (156 donkeys, 177 horses and 7 of mules) examined, the prevalence of GI parasites was found to be 69%, 36.16% and 42.88%, respectively (Table 3). There was a statistically significant difference (P<0.05) between the prevalence of GI parasites in different age groups (Young Vs Adult) among equine species.

The prevalence of GI parasites in female donkeys, horses and mules of the examined animals was found to be 75.61%, 44.44% and 50%, respectively. However, the prevalence GI parasites of male equine species were found to be 66.04%, 42.04% and 50% (Table 4).

The comparative prevalence of GI parasites of horses between rural and urban areas in and around Asela is presented below in Table 5. The urban horses are mainly used for cart pulling taxi in the study districts town.

Quantitative fecal analysis was made for each species of equines positive for qualitative fecal examination techniques using modified MC master egg counting technique (Table 6).

The coproculture performed on 80-pooled fecal samples revealed three *Strongyle* genera, which were: *Strongylus vulgaris* 43.07%, *Strongylus edentatus* 28.63%, *Cyathostomes* species 20.69% and *Triodonthophorus* species 7.6% (Table 7).

DISCUSSION

The results of the present study clearly demonstrated that gastro-intestinal parasites are highly prevalent in equine of Tiyo district. The overall prevalence of GI parasites was 70.21%, 42.55% and 40% in horses, donkeys and mules, respectively. This is in line with previous report from Ethiopia by Hagos [3] and other countries such as USA [18] and South Africa, Krecek *et al*. [19] which indicated prevalence ranging between 80% and 100%.

Previous studies indicated that the prevalence of GI parasites working donkeys in Ethiopia to be in the range of 70-100% [8, 10, 11, 20]. However, the prevalence from the present study was lower. This might be due to the lower sample size and also where the majority of sampled donkeys were from the town and in good nutritional condition.

The prevalence of *Parascaris equoroum* was 24.3%. This finding is in agreement with Mulate *et al.* [21] who reported 43.8% in South and North wollo provinces and Gazahegn [22] who reported 40.33% in and around Bahir Dar. Furthermore, Hassan [5] and Yoseph *et al.* [9] have reported 12.8% and 17.3%, respectively from different parts of Ethiopia and relatively lower than the present finding. This might be because of differences in climate and altitude.

In the current study the second major GI parasites was *Parascaris equoroum* with the prevalence of 24.3%. This result was in line with reports by Yoseph *et al.* [9] and Mulate [21]. Acquired resistance to *Parascaris equorum* usually develops before the second year of life and therefore, cases were highly reported from younger animals [23]. The prevalence of *Gastrophillus* species was 23.25%. This is in agreement with Ayele *et al.* [24] who reported 20.9% in Dugda Bora district. *Trichonema* had lower prevalence 9.25% when compared to the previous studies by Alemayehu [25] and Mohammed [26].

Lower prevalence (2.5%) of *Fasciola* was recorded in the present study compared to other reports in central high lends of Ethiopia by Mulate [21]. This might be due to the differences in ecological conditions of the study areas. Hammami and Ayadi [27] reported that permanent dampness, suitable luminosity, basic ph of soil, water and temperature contribute to the multiplicity of snails.

The *Anoplocephala magna and Paranoplocephala perfoliata* were the least prevalent adult cestodes in the current study with prevalence of 2.25% and 1.25%

respectively. This low prevalence could be due to the seasonality of orbited mites vectors [28]. Similar results have been reported in the survey of helminthosis conducted in the central highlands of Ethiopia by Yoseph *et al.* [9] and Desalegn [29].

The overall prevalence of *Dictyocaulus arnifield* was 28% which was quite higher than reports by Hassan [5] and Yoseph [30] who reported 3.3% and 9.38% respectively. However, other authors reported comparable results as 20% and 32% by Gazahegn [22] and Ayele *et al.* [24]. This is might be also due to the differences in argo-ecology of these study areas and number of sampled donkeys. Donkeys act as reservoir of *Dictyocaulus arnfield* and source of infection for horses [31].

The prevalence of GI parasites of all equine species in young and adult animals was found to be 80% and 51.47%, respectively, with statistically significant difference ($P<0.05$) between age groups, where young seemed to be more susceptible than adults. This result was in agreement with Alemayehu [25] and Yacob Hailu Tolossa and Hagos Ashenafi [32]. Acquired resistance to most of GI parasites of equine usually develops before the second year of life and therefore, cases are highly reported from younger animals [23].

The considerable difference observed in the prevalence of GI parasites of equines kept in uraba and rural areas which might be due to difference in husbandry and management practices of the study animals. The type of feed in urban areas was concentrated and cross residue. Owners from urban areas were also known to administer antihelmintic drugs when animals emaciated. Almost all rural horse owners practice closed type of housing together with other livestock group. The greater load of infection in rural horses may be also due to communal pasture grazing while urban horses mainly depend on in door feeding system.

The quantitative faecal egg examination, using the logarithmic transformation to determine the egg excretion per gram of faeces, showed the mean egg output to be 865.28. Out of 222 faecal sample examined by MC master egg counting technique 13.06% and 37.84% were massively and highly infected, respectively. This result is in agreement to reports of Yacob Hailu Tolossa and Hagos Ashenafi [32] and Yoseph [33]. A relatively higher mean egg per gram of feces was observed in equine of the study districts was also in agreement with findings of Krecek *et al*. [19] who reported the spring rise of strongyle eggs output in grazing horses. This is also attributed to the favorable condition of wet and humid environment to the biology of these parasites while the differential larval count indicated that *S. vulgaris*, *S. edentatus* and *Cyathostome* species were the major parasites of horses in the studied districts. This result is in line with the findings of Yacob Hailu Tolossa and Hagos Ashenafi [32] and Feseha [34].

In conclusion, the results of the present study showed that polyparasitism is one of the commonest ill-causing factors and indeed the main cause of early demise of equine in the study districts. The presence of more than one helminths of equine in these study areas may be related with lack of control measures against helminth parasites, specifically the lack of regular deworming practice that might have attributed to the incidence of polyparasitism. The climatic condition of the study region where rainfall is frequent and temperature is mild also favors the development and survival of infective larvae for most part of the years. Owing to the huge equine population in the study area considerable contamination to the communal pasture grazing system could be the other factor which favors polyparasitism in the area. However, the problem due to gastrointestinal helminths 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.

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