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Epidemiology of Horse GIT Parasitism in Gondar Town and Wegera District

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Abstract: A cross sectional study was conducted from November 2017 to April 2018 in and around Gondar town and Wegera district to determine the prevalence identification of horses GIT nematode parasites. A total of 384 faecal samples were collected from randomly selected horses and examined for nematode parasites. Out of the total examined horse 349 (90.9%) were harbour one or more types of GIT nematode. Nematodes type identified in horse of the study area were *Strongyle* spp*, Parascaris equorum, Oxyuris equi* and mixed type. Significantly higher prevalence of nematode infection was observed in young horses than the adult (OR=7.78, p<0.05); the risks of nematode infection in young horses were 7.78 times higher than adults. Likewise, significant variation in overall prevalence of GIT nematode in between female and male horses were observed (OR=0.34, P<0.05). Significant difference on the prevalence between different body conditioned animals were observed; in which higher value observed in poor body condition horses (OR=4.28, p<0.05). Also significant variation on the prevalence of GIT nematodes were also recorded between the study areas (OR=3.22, p<0.05). In this study, age, body condition score, sex and origin are risk factors associated with prevalence of horse GIT parasites in the study areas. In the study area poor nutrition, low productivity in horse is likely to be aggravated by a high prevalence of polyparasitism. Therefore, regular deworming, improvement of housing and feeding management should be recommended.

Key words: *Gastrointestinal Parasites · Gondar · Horses · Prevalence · Wegera*

INTRODUCTION

Horses are important animals to the resource-poor communities in rural and urban areas of Ethiopia. As per the survey results of Central Stastical Agency (CSA) 2016/2017, there are about 2.16 million horses, 8.44 million donkeys and 0.41 million mules in Ethiopia [1]. These groups of animals provide traction power and transport services at low cost. They also play a major role in the food supply and social wellbeing of rural communities living in conditions of extreme poverty [2]. Their power is the best alternatives in places where the road network is insufficiently developed, the terrain is rugged and mountainous and in the cities where narrow streets prevent easy delivery of merchandise [3].

Parasitism is the single most important impediment in successful horse rearing area all over the world and many species of parasites are found to infect horses. They are prone to infestation by a mixture of internal and external parasites. Among the internal parasites the large and small Strongyles, Ascarids, Oxyuris, Gastrophilus and lung worms are common [2,4]. They can harbour a great number of parasites without exhibiting any clinical signs and resulting in significant morbidity and mortality. Mortality of horse has been frequently associated with strongyles, tapeworms, ascarids, trypanosomes and *Babesia* spp [5-8].

The epidemiology of gastrointestinal parasites in horse varied depending on the local climatic condition, such as humidity, temperature, rainfall, vegetation and management practices. These factors largely determine the incidence and severity of various parasitic diseases in a region [9]. Intestinal parasites such as helminth usually produce insidious diseases in animals. Infected horse may show signs of weakness, emaciation, restlessness, unthriftiness, diarrhea, anemia and sometimes intestinal obstruction or perforation [10]. Horse owners may not easily detect the effect of gastrointestinal parasites because of the subclinical nature of the infections [11]. Thus, the sub-clinical nematode infections are responsible for significant economic losses. They are responsible for immune-suppression and enhancing the susceptibility of

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the animals to other diseases. Once the clinical diseases are noticed, such economic losses in terms of animal productivity have already occurred [2, 10].

The diagnosis of gastrointestinal nematode infections in horses has been based on the detection of nematode eggs or larvae in the faeces by microscopic examination using the methods of flotation and/or larval culture. Quantifying of the egg per gram of faeces is the best way of estimating parasite loads [12]. Studies on prevalence of horse helminths in different parts of world have indicated varied prevalence under different management and parasite control systems [13-17].

Although considerable work has been done on endoparasites of horse in many parts of Ethiopia, however there were limited study carried out on the prevalence and intensity of horse gastrointestinal nematodes in and around Gondar town and no studies conducted in wegera district. Knowing the status of gastrointestinal nematode in the area could be the basis for undertaking all possible actions including its control and prevention. The potential utilization of horse in different parts of the world was affected by parasitic disease since they may not induce clinical disease and hinders the horse from providing enough drought power.

Therefore, the objectives of the present study were to determine the prevalence of horse GIT nematodes in the study area and to identify the possible risk factors associated with horse gastrointestinal nematode infections.

MATERIALS AND METHODS

Study Area and Study Population: The study was conducted from November 2017 to April 2018 in and around Gondar town and wegera district the former North Gondar zone and the then central Gondar zone, Amhara National Regional State. Gondar town is located at 728 Km 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. Wegera is one of the districts of North Gondar Administrative Zone, located at 782 km northern of the capital city, Addis Ababa, in between 37.36°E and 12.46°N longitude and at an altitude of 2900 m.a.s.l in the northern highlands of Ethiopia. The rainfall pattern of the district is bimodal, with a short rainy season from March to May, followed by a long rainy season from June to September. It has an average annual rainfall of 700 mm and the mean annual temperature is 12.7°C. The population of animals in north Gondar zone includes 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 mixed type (Crop-livestock production) [1]. The study population were indigenous breeds of horses of all age group kept under traditional extensive management system for carting, transportation and crop cultivation.

Study Design: A cross-sectional study was conducted from November 2017 to April 2018 to determine the prevalence of gastrointestinal nematodes infection in horse and to identify the potential risk factors.

Sample Size Determination and Sampling Method: The study areas were selected purposively based on inadequate studies and no works conducted previously as well as the potential utilization of horse by the community in the areas. Each sample units were selected by simple random sampling technique from communal grazing pasture in Wegera district and cart station in Gondar town. Upon sampling sex, age, body condition score of animals and districts were recorded. All the study animals were local breeds, kept under traditional extensive management system. Conventionally, those animals with the age of less or equal to four year were considered as young while those greater than four year was included as adults according to the classification of age groups by [18]. The body condition scoring was classified into three categories as poor, medium and good according to Carroll and Huntington [19].

The sample size for the study were determined based on expected prevalence rate of 50 %, absolute desired precision of 5 % at confidence level of 95 %. The sample size was calculated according to the following formula [20].

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

where,
N= total number of sample size
P_{exp}= Expected prevalence
d= Absolute precision

Therefore based on the above formula a total of 384 horses of the study area were included in the study.

Sample Collection and Laboratory Procedure: Fresh faecal samples approximately 10 g were collected directly from the rectum of study animals, samples placed in labelled sampling bottles and then after transported to laboratory for analysis. Following transportation of faecal sample laboratory analysis was carried out at the same day and the remaining samples were kept under 4°C and examined up on the next days. Coproscopic examinations were performed to detect nematode eggs using the standard flotation and sedimentation technique [21].

Data Management and Analysis: The collected data was recorded and entered into Microsoft Excel sheet. Before subjected to statistical analysis, the data were thoroughly screened for errors and properly coded; finally statistical data analysis was performed using SPSS version 20 software packages. Descriptive statistical analysis such as table, graph and figures were used to summarize and present the output from the data collected. The prevalence of GIT helminthes infections were calculated as percentage by dividing total number of horses positive for GIT nematodes infection to the total number of horse examined. Pearson chi square (x^2) test and binary logistic regression were used to assess the existence of association between the GIT nematodes infection with different risk factors and to evaluate degree of association. For (x^2) test, p-value<0.05 were considered as significant while p-value>0.05 considered as non significant.

RESULTS

The Overall Prevalence: Coprological examination revealed that from the total examined horses 349 (90.9%) was found positive for different nematode parasites in the study area.

As it was demonstrated in fecal examinations, among parasitic nematodes determined in horses, the highest prevalence was *Strongyle* type egg (58.6%) followed by mixed *Strongyle* type egg and *Parascaris equorum* (24.5%), *Parascaris equorum* (5.2%) mixed *Strongyles* and *Oxyuris equi* (1.6%) and mixed *Parascaris equorum and Oxyuris equi* (0.5%) (Figure1).

Table 1: Total prevalence of gastrointestinal nematodes.

Number of examined	Number of positive	Prevalence
384	349	90.9%

Age Wise Prevalence: Out of 384 sampled horses 65 (98.5%) and 284 (89.3%) young and adult horses were positive for single or multiple types of nematode eggs respectively. Significantly higher prevalence of horse GIT nematode was recorded in young foals than adult animals (x^2=5.56; p<0.05, OR=7.78) (Table 2).

Prevalence of Gastrointestinal Nematodes in Horses: Sex Wise: From the total 200 male and 149 female horses examined (87.7%) and (95.50%) were found to harbor nematode eggs respectively. Significantly higher prevalence of GIT nematode infection in females horses were recorded than male (x^2 = 6.79; p<0.05, OR=0.34) (Table 2).

Prevalence of Gastrointestinal Nematodes in Horses Based on Body Condition: The study includes 140 poor, 201 medium and 43 good body condition horses. The prevalence of GIT nematodes on the basis of body condition of the horse indicated the highest infection rate was recorded in poor body condition animals with no horse was free from nematode egg 140 (100%) followed by medium body condition 175 (87.1%) and good body condition horses have relatively low nematode infection 34 (79.1%). The difference was statically significant (x^2 =32.16; P <0.05, OR=4.28, 1.78) (Table 2).

Origin Based Prevalence: From the total animals included in this study 113 samples were collected from in and around Gondar town and 271 samples were collected from

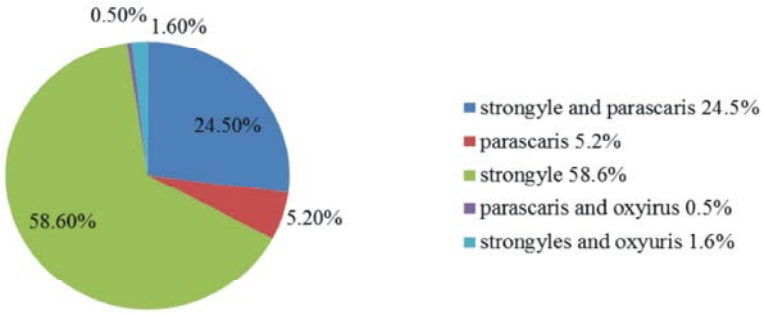

Fig. 1: Prevalence of nematode parasite in horses.

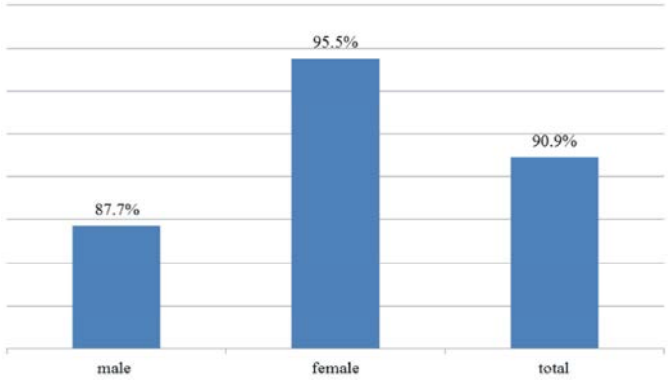

Fig. 2: Sex wise prevalence.

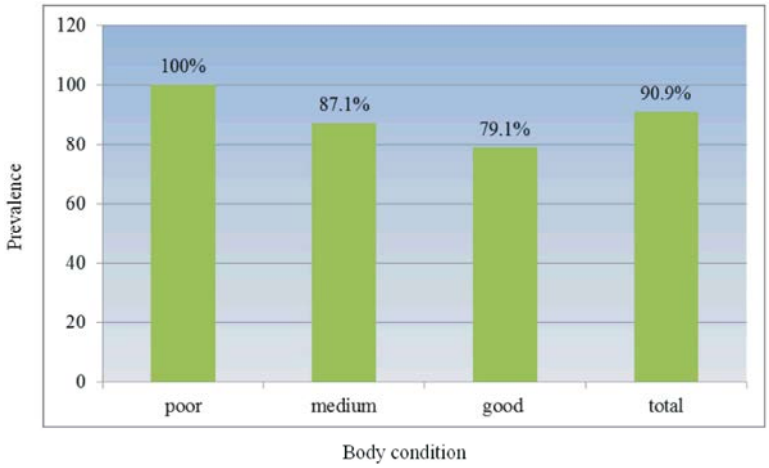

Fig. 3: Body condition based prevalence in the study area.

Table 2: Summary of statistical result on horse gastrointestinal nematode of study areas.

Risk factor	No. of examined	No. of positive	prevalence	OR(95%CI)	χ^2	P-value
Age						
Young	66	65	98.50%	7.78(1.046, 57.889)	5.56	0.018
Adult	318	284	89.30%	RF		
Sex						
Male	228	200	87.70%	0.34(0.143, 0.789)	6.79	0.009
female	156	149	95.50%	RF		
B. condition						
Poor	140	140	100%	4.28	32.16	<0.001
Medium	201	175	87.10%	1.78(0.767, 0.937)		
good	43	34	79.10%	RF		
Origin						
Gondar town	113	94	83.20%	RF	11.46	0.001
wogera	271	255	94.10%	3.22(1.590-6.525)		

Wegera district. Prevalence of GIT nematode infection was found to be 94(83.2%) and 255(94.1%) in and around Gondar town and Wegera district, respectively and it's statistically significant (x^2 = 11.46; P<0.05, OR=3.22). Thus, prevalence of nematode parasite was higher in Wegera district (Table 2).

DISCUSSION

Gastrointestinal nematode infection is the main disease condition affecting horses in tropical and sub-tropical areas of the world [22]. In this study, microscopic fecal examination showed that GIT nematode parasite was

an important health problem in the study area with over all prevalence rates of 90.9% which is in virtual agreement with Sultan *et al*. [23],Tolossa and Ashenafi [24], Mezgebu *et al*.[25], Oli and Subedi [26], Aypak and Bergu [27], who reported the prevalence of 84%, 84.4%, 92.71%, 84.76% and 88.6% in Kurfa chale Ethiopia, in Arsi-Bale highlands of Oromiya Region, Gondar town, in seven village development committee of Rukum district and in Aydin region of Turkey respectively. However the prevalence of infection observed in this study is lower than [28-30], who reported the prevalence of 97.9%, 100%, 100% and 100% in Baquba city, Aldiwaniyah Governate and Turkey, respectively and it was higher than [9, 31-38], who reported 69%, 55.7%, 59.3%, 63.7%, 60.68%, 51.7%, 59.25%, 24.6% and 65.1% in Menz keya Gerbil district, Kombolcha town, Mekelle, Hawassa town, South Wollo Ethiopia, Warmia of Mazury, Jabalpur region of North India, North Dardfur in Sudan and Lahore respectively.

Among nematodes identified in this study, Strongyle type egg (58.6%) was signi?cantly higher than other detected nematode eggs, which was in line with the findings of Andarge *et al.* [2], Saeed *et al.* [38], Wosu and Udobi [39], who reported the respective prevalence of strongyle spp as 63.72% in Jimma Town, 55.3% Savannah Zone of Northern Nigeria and 58.5% Lahore. But the result was higher than the reports of Shiret and Samuel [33], Yadav *et al.* [36], Ashenafi *et al.* [40], Disassa *et al.* [41], who reported the prevalance of 36.8%, 4.92%, 27% and 25% in and around kombolcha town, in and around Dangila town, in and around Mekelle town and Jabalpur region of North India, respectively.

In this study the prevalence of *Parascaries equorum* was 5.2% which was comparable with result reported in different areas of study as 5.4%, 6.5% and 5% in South Wollo Zone, in and around kombolcha town and Lahore by Shiret and Samuel [33], Regassa and Yimer [34], Saeed *et al.* [38]. But the result in the study area was lower than the study reported by Andarge *et al.* [2], Disassa *et al.* [41], Shiferaw *et al.* [43], Bucknell *et al.* [44], who recorded the respective prevalence of 17.98%, 55.8%, 36.2% and 12.9% in Jimma town South Western Ethiopia, in and around Hawassa town, south and north Wollo zones and in Wonchi Ethiopia. The lower prevalence of *P. equorum* in the present study could be due to collection of faecal samples from adult horses with only few from young horses. Horses up to six months of age are the most susceptible to infection. After this time, an infection rate begins to decline and is extremely uncommon in adult horses [26,44,45].

Mixed infection with strongyle spp and *P. equor*um was recorded 24.5% prevalence, which was lower than the result 62.5% reported by Yadav *et al.* [36] in Jabalpur region and higher than the report by Belay [46] and Regassa and Yimer [34] who recorded the prevalence of 2.6% and 6.5% in and around Kombolcha town and in South Wollo Zone respectively. Strongyles and *O. equi* eggs were also identified at the same time in a sampled animal and recorded 1.6% which was consistent with 1% prevalence reported by Belay [46] and slightly lower than the report (4.8%) by Regassa and Yimer [34]. Likewise the prevalence of mixed infection with *P. equorum* and *O. equi* in this study was found 0.5%.

The high prevalence of gastrointestinal nematodes is usually associated with the poor managemental system given to animals [47-49]. Most of the economically important parasites (*Strongylus* spp, *Parascaris* spp and *Oxyuris* spp) recorded in the present study have direct life cycles, where adult parasites living within the horse sheds ova (eggs) which are excreted in pasture, the larvae develop, hatch and moult to the infective third stage (L3) which serve as a source of contamination of housing facilities, exercise areas, pasture and feedstuff, resulting either in infection or re-infection of susceptible horses. This could lead to the high prevalence of the gastrointestinal nematodes [39].

Lower prevalence of some parasites type in this study might be attributed to sensitivity of diagnostic technique or difference in agro ecological zones of the areas [13,26]. Some other factors like management, climate and parasite control program can also in?uence the prevalence of parasitic disease of domestic animals. Use of broad spectrum anthelmintics like benzimedazoles and macrocyclic lactones has resulted in drastic reduction in worm populations [50]. Many intrinsic (sex, age, breed) and extrinsic factors (management, climate and parasite control program) influence the prevalence of parasites of domestic animals [38].

In the current finding 98.5% and 89.3% prevalence of gastrointestinal nematode was observed in young and adult horse, which were consistent with reports of Andarge *et al.*[2], Wubishet and Yacob [51], Mangassa and Tafese [52]. This result disagrees with works of Sultan *et al.* [23] who reported 25.7% and 61% in young and adult horse respectively. The prevalence among the two age groups was statistically significant in the current study ($P<0.05$) which agree with the report by Samuel *et al.* [32], Ashenafi *et al.* [40], Mangassa and Tafese [52], Asefa and Dulo [53]. Young age horses of the study area were 7.78 times at risk for the diseases than

adults. But the association was insignificant (p>0.05) according to Tesfu *et al.* [9], Regassa and Yimer [34], Saeed *et al.* [38]. Higher infection rates and more severe infections indicate a lack of immunity in younger population [11].

The prevalence of gastrointestinal nematodes in horses was found to be higher in female horses (95.5%) in comparison to males (87.7%). Similar findings have also been reported by Andarge *et al.* [2], Oli and Subedi [26], Wubishet and Yacob [51],Asefa and Dulo [53] who have found higher prevalence in female horses as compared to males. However [10,46, 54] reported a higher prevalence of infection in male horses than females. According to this study statically significance difference (P <0.05) between the prevalence of GI nematode and sex of horses was recorded, which is in agreement with the study by Saeed *et al.* [38] but not inline with the findings of Disassa *et al.* [41], Belay [46]. In this study male horses were 0.304 times less likely affected by gastrointestinal nematodes than female horses.The significance difference might be due to the reason that almost all cart horses sampled in Gondar town are males, hence these horses which are used for cart traction are regularly dewormed and have better managmental practice because owners know about good husbandary practice of their horse as they are the basis for their daily life. Whereas, the attention given to female horses in Wegera district is less and have no regular deworming and well designed managemental approaches.

The prevalence according to body condition was 100%, 87.1% and 79.1% in poor, medium and good body condition scores, which is higher than the report by Mangassa and Tafese [52] as 59.26%, 43.17% and 30.6% and [9] who reported as 72.5%, 71.6% and 70.7% in poor, medium and good body condition scores, respectively. Statistically significant difference of GI nematodes in horse between different body condition score was observed (P <0.05) and this report agrees with the findings of Andarge *et al.* [2], Samuel *et al.* [32], Mangassa and Tafese [52], Khallaayoune [56]. In the present study, the prevalence of gastrointestinal nematodes was 4.276 times higher in animals with poor body condition compared to those with good body condition score and 78.2% more likely occurrence in medium than good body condition horses. But this study contradicted with reports of Asefa and Dulo [53] who reported no association (P >0.05) with the prevalence of the GI nematode parasite and body condition scores. The high prevalence in poor body condition is due to the parasite share nutrients of animals, impairment of digestion and absorption and predispose for further infection [12].

From the total sampled horses prevalence of gastrointestinal nematode in horse from Wegera (94.1%) was higher than Gondar town (83.2%). Statistical significant difference on the prevalence was recorded based on the origin of the animal. The higher prevalence in Wegera is assumed to be poor management and regular deworming practice than horses in Gondar town, which had better parasite prevention and control measures. According to the study there was statically significance (p<0.05) between the prevalence and district of sampled horses. Analysis of the data revealed that horses in Wegera district were 3.221 times more likely at risk for gastrointestinal nematode infection than horses of in and around Gondar town. This report was in line with the finding by Samuel *et al.* [32], who determined the effect of origin in nematode prevalence. Horses in Wegera was highly infected since grazing is the main feeding system and no care is given for the equines of the area, likewise deworming and supplementary feeding is not practiced in this district, while cart horses are dewormed regularly and feed grains rather than grazing. In addition the difference in agro ecology may also affect in the prevalence of nematodes.

CONCLUSION

The present study conducted on horse's gastrointestinal nematodes in and around Gondar town and Wegera district of Amhara regional state showed that gastrointestinal nematodes are an important health problem in the area affecting the well-being and productivity of horses. The study revealed that prevalence of helminthes like *Strongyle* spp, *Parascaris equorum, Oxyuris equi* and mixed infections. The prevalence was significantly associated with age, sex, body condition score and district of the horses. The attention given to the parasitic disease so far has not been sufficient. Even though, horses are paramount important animals in livelihood of the population, the existing livestock extension package program of the region and the country is not doing enough about the management and health aspect of this group of animals. Therefore, comprehensive study about the epidemiology of gastrointestinal nematodes should be launched in the study area, regular and strategic deworming programmes with efficacious anthelminthics should be carried out regularly; improved housing, feeding and managemental system should be implemented to decrease the incidence of parasites in horse.

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