Prevalence of Gastrointestinal Nematode Parasites of Horses and Donkeys in and Around Sagure Town, Ethiopia

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Abstract: A cross sectional study was conducted from November 2016 to April 2017 in and around Sagure town to know the prevalence of gastrointestinal nematode parasites and associated risk factors in donkeys and horses. The fecal sample from (n=222) donkeys and (n=162) horses were collected and examined for gastrointestinal nematode parasites using floatation technique. The overall prevalence was 88.3% (339 from 384) with 88.7% in donkeys and 87.7% in horses. The parasites identified in this study were Strongyles, Parascaris equorum, Oxyuris equi and Strongyloides westeri with respective prevalence of 68%, 6.3%, 3.6% and 2.7% in donkeys and 63.6%, 6.8%, 3.1% and 3.7% in horses respectively. There were also mixed infections of gastrointestinal nematode detected with total prevalence of 8.1% in donkeys and 10.5% in horses. The associated risk factors; species, sex, age, body conditions and deworming status with the occurrence of gastrointestinal nematode parasites were assessed. The prevalence was slightly higher in donkeys than horses, female than male, in poor than good and medium body condition score and in treated than non treated. However, the statistical significant was determined only among body condition score and deworming status. The result of present study shows the highly prevalence of gastrointestinal nematode parasites in horses and donkeys so strategic control measures should be performed in the study area.

Key words: Donkey · Gastrointestinal nematode parasites · Horse · Prevalence · Risk factors · Sagure town

INTRODUCTION

Working equids (horses, mules and donkeys) have an essential role in the livelihoods of millions of people worldwide. These equids perform numerous activities on a daily basis, including the transportation of goods, people and construction materials, as well as being used in agricultural and tourism activities [1]. The world equine population is 122.4 million consisting of 40 million donkeys, 15 million mules and 43.4 million horses. From global distribution of view, 98% of donkeys, 97% of mules and 1% of all horses are found in developing countries. The equine population in Africa is 17.6 million donkeys, 2.3 million mules and 3.7 million horses [2].

Ethiopia has a total of 9.83 millions equine populations. From those numbers, donkeys account 7.04 million while horses and mules are 2.03 and 0.4 million respectively [3]. In Ethiopia, the low level of development of the road transport network and the rough terrain of the country make the donkeys and the horses the most valuable, appropriate and affordable pack animals under the small holder farming system [4]. Equines are important animals to the resource poor communities in rural and urban areas of Ethiopia, providing traction power and transport services at low cost. The use of equines indoor to door transport services also provides urban dwellers with the opportunity of income generation [5].

Parasitic helminthes are one of the most common factors that constrain the health and working performance of donkeys and horses worldwide. They cause various degrees of damage on the equine depending on the species and number of parasites, nutritional and the immune status of equids [6]. They decrease the performance, production and productivity in the animals mainly in the reduction of body weight or failure to gain weight or even increase the mortality in acute case [7]. A number of studies conducted to detect association between poverty and animal diseases identified gastrointestinal parasitism as one of the most important problems for equids in developing countries. Equines are
hosts to great nematodes of the family Strongylidae, commonly called Strongyles nematodes. The most common gastrointestinal nematode parasites of equines include large strongyles, small strongyles, Ascaris (Parascaris equorum) and pinworms (Oxyuris equi) [8]. The egg of gastrointestinal nematodes found in the feces. Whatever most gastrointestinal worm populations constitute a large variety of species which cause health problems in horses and donkeys. Previously, there was no any research done in the study area. Therefore the Objectives of this Study Were:

- To determine the current prevalence of gastrointestinal nematode infections of working donkeys and horses in and around Sagure town.
- To identify the types of gastrointestinal nematode parasites of working donkeys and horses in the study area.

MATERIALS AND METHODS

Description of Study Area: The study was conducted in and around Sagure town from November, 2016 to April, 2017 in the Oromia Region of Ethiopia. Sagure town is the administrative center of the Digelu and Tijo woreda. Geographically; it is located at 193 km from Addis Ababa. The climatic condition of the town is “woynadega” and the town is located at altitude of 2000-3600 m.a.s.l. The day and night temperature of the area ranges from 10-22°C and 10-20°C respectively. The area has a bimodal rain fall occurring from March to April (short rainy season) and from July to October (long rainy season) with annual rainfall of 900-1400mm. The soils of the area had 44% red, 35% loam and 21% brown. Live stock population in the woreda include; 213167 cattle, 119544 sheep, 8170 goat, 23354 horse, 15560 donkey, 324 mule and 104830 poultry [9].

Sampling Technique and Sample Size Determination: Sampling method followed was a household based on stratified random sampling in which the study animals were randomly selected from kebeles of Sagure town and surrounding villages in every two household. The sample size was determined using the formula given by Thrusfield [11]. Since there was no information about the prevalence of the disease in the study area, 50% expected prevalence was taken to calculate the sample size with a 5% desired absolute precision and 95% confidence interval. Hence, according to the formula given below and the total sample size was 384 donkeys and horses.

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

where:
- \( n \) = required sample size
- \( P_{exp} \) = expected prevalence of nematode parasites
- \( d \) = desired absolute precision
- 1.96 = the value of “Z” at 95% level of confidence

Study Methodology

Sample Collection and Transportation: Random faecal samples were collect directly from the rectum of the study animals using disposable plastic gloves and placed in into universal bottles. Each sample was labeled with the code number, date of collection, age, sex, body conditions and number of animal owned in edible pen. The collected samples were kept in icebox and transport to Asella Regional Veterinary Laboratory as soon as possible. Samples were kept in refrigerator at 4°C when immediate processing was not possible. But, it was processed within 48 hours. Some samples were held using10% formalin.

Faecal Examination Technique: Parasitological examination was done by flotation techniques [12] following the standard procedures for nematode parasites and examine microscopically (10× and 40×). The floatation fluid used in the study was supersaturated solution of sodium chloride (NaCl) salt prepared in the laboratory. The procedure given by Gutpa and Singla [13] was followed for the parasitological methods and eggs were identified by ova identification keys.

Data Analysis: The collected data were coded and entered into Microsoft excel spread sheet. Statistical analyses were performed using SPSS, version 20 software packages. Percentage was used to calculate prevalence. Data were statistically analyzed using chi-square. In all cases 95% confidence interval (CI) and \( p < 0.05 \) was considered for statistically significant difference.
Table 1: Overall prevalence of GIT nematode parasites in Horses and Donkeys during study period:

<table>
<thead>
<tr>
<th>Species of animals</th>
<th>Number of animals examined</th>
<th>Number of positive animals</th>
<th>Prevalence (%)</th>
<th>$\chi^2$</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donkeys</td>
<td>222</td>
<td>197</td>
<td>88.7</td>
<td></td>
<td>0.137</td>
</tr>
<tr>
<td>Horses</td>
<td>162</td>
<td>142</td>
<td>87.7</td>
<td></td>
<td>0.712</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>339</td>
<td>88.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Overall Prevalence of GIT nematode infection related with associated risk factors in the study area:

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Number of animals examined</th>
<th>Number of positive animals</th>
<th>Prevalence (%)</th>
<th>$\chi^2$</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>169</td>
<td>152</td>
<td>90</td>
<td>.106</td>
<td>0.744</td>
</tr>
<tr>
<td>Male</td>
<td>215</td>
<td>187</td>
<td>87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bcs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>119</td>
<td>96</td>
<td>80.7</td>
<td>14.051</td>
<td>0.001</td>
</tr>
<tr>
<td>Medium</td>
<td>186</td>
<td>166</td>
<td>89.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>79</td>
<td>77</td>
<td>97.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deworming Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non treated</td>
<td>299</td>
<td>270</td>
<td>89.3</td>
<td>5.326</td>
<td>0.021</td>
</tr>
<tr>
<td>Treated</td>
<td>85</td>
<td>69</td>
<td>81.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>103</td>
<td>92</td>
<td>89.3</td>
<td>3.637</td>
<td>0.162</td>
</tr>
<tr>
<td>Adult</td>
<td>213</td>
<td>183</td>
<td>85.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old</td>
<td>68</td>
<td>64</td>
<td>94.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RESULTS

During the study period, fecal sample was taken from a total of 384 equines (222 donkeys and 162 horses) were thoroughly observed for the presence of different gastrointestinal nematode (GIN) parasites using floatation technique. From the observed animals, 197 (88.7%) donkeys and 142 (87.7%) horses were positive for different nematode parasites. The overall prevalence of GIN parasitic infection for both species in the present study was 88.3%. The chi-square analysis revealed the existence of difference in the occurrence of parasitic infection among the horse and donkey ($\chi^2 = 0.137$, $P = 0.712$) while there was no statistically significant difference as indicated in (Table 1).

In relation to body condition of the animals, the prevalence of parasite in donkeys and horses with poor body condition was higher (97.5%) than those in good (80.7%) and medium (89.2%) body condition score with statistically significant difference ($P < 0.05$). The prevalence according to age group was 89.3%, 85.9% and 94.1% in young, adult and old animals, respectively, while in female animals slightly higher rates (88.7%) than male (87.7%). Prevalence as deworming status was higher in animals which were not having a history of treated ($\chi^2 = 6.245$; $P = .012$) and age ($\chi^2 = 44.539$; $P = .000$) while the significant variation in the occurrence rate of Strongyles and Parascaris equorum were observed among the body condition score categories ($\chi^2 = 7.333$; $P = .026$) and $\chi^2 = 9.675$; $P = .008$) respectively. Similarly, it was observed that age was the important factor for the variation in the occurrence rate of Strongyles and Parascaris equorum ($\chi^2 = 40.585$; $P = .000$) and Oxyuris equi ($\chi^2 = 6.203$; $P = .045$) (Table 4).

Among the identified gastrointestinal nematode parasites, the highest relative percentage was recorded for Strongyles (74.9%) followed by Parascaris equorum (7.4%), Oxyuris equi (3.8%) and Strongyloides westeri (3.5%). Similarly, the highest rate of double infection was observed in case of Strongyles plus Parascaris equorum (5.3%) followed by Strongyles plus Oxyuris equi (3.5%) and Strongyles plus Strongyloides westeri (1.5%) (Table 3).

The prevalence of parasites encountered in both horses and donkeys during study period were Strongyles (63.6% and 68%), Parascaris equorum (6.3% and 6.8%), Oxyuris equi (3.1% and 3.6%), Strongyloides westeri (3.7% and 2.7%) in horses and donkeys respectively. Strongyloides westeri significantly varied between sexes ($\chi^2 = 6.245$; $P = .012$) and age ($\chi^2 = 44.539$; $P = .000$) while the significant variation in the occurrence rate of Strongyles and Parascaris equorum were observed among the body condition score categories ($\chi^2 = 7.333$; $P = .026$) and $\chi^2 = 9.675$; $P = .008$) respectively. Similarly, it was observed that age was the important factor for the variation in the occurrence rate of Parascaris equorum ($\chi^2 = 40.585$; $P = .000$) and Oxyuris equi ($\chi^2 = 6.203$; $P = .045$) (Table 4).
DISCUSSION

The current study determined an overall prevalence of gastrointestinal nematode parasites with 87.7% in horses and 88.7% in donkeys. This finding is higher than the report of work of Tesfu et al. [14] in Hawassa town, Sawsan et al. [15] in South Darfur state, Regassa and Yimer [16] in South Wollo zone with their respective results of 72.7%, 29.79% and 70.4%. The result of current study is relatively lower than reports of Mezgebu et al. [17], Ibrahim et al.[18] and Ayele et al. [19] with their respective results of 92.71%, 96.9% and 98.2% for GIN parasite infection of equine as in and around Gondar, in Hawassa Town and Dugda Bora District, respectively. This difference might be due to Climatic variations, animal management [20].

In this study, relatively slightly higher overall prevalence of GIT nematode parasites was recorded in donkeys (88.7%) than horses (87.7%). This study agrees with the study of Samuel et al. [21] in and around Kombolcha, Tesfu et al. [14] in Hawassa town, Regassa and Yimer [16] in South Wollo zone, Mezgebu et al. [17] in Gondar town and Seri et al. [22] in Sudan with their respective results of 86.5%, 72.7%, 70.8%, 92.71% and 37.48%.

In this study an assessment was done on the relationship between different risk factors and parasitic infections. Age, sex, body condition score, deworming status and management system were considered as risk factors. In relation with sex, the prevalence of GIN was (74.9%), which was lower than the reports of Wondamu and Sharew [25], with 84.47% and 98.22% in horses and donkeys respectively in Gondar town, Ayele et al. [19] who reported 100% prevalence in donkeys at Dugda Bora District and Getachew et al. [26] who reported 99% prevalence in working donkeys of Ethiopia. This may be due to the presence of different geographical and climatic females. The current study also indicates relatively higher infection in old (94.1%) than adult (85.9%) and young (89.3%), but the difference was not statistically significant ($\chi^2=3.499$, P>0.05). Similar result was reported by Tesfu et al. [14] and Samuel et al. [21]. Such finding result may be attributed to prolonged exposure of elderly animals to posture contaminated of parasite throughout their life.

The difference in prevalence between body conditions of animal was statistically significant higher prevalence was observed in poor than good and medium body condition score. This is similar with report of Tesfu et al. [14]. This might be due to increased land of cultivation which restricts animals on small communal grazing land which allows animals for continuous exposure [18].

The proportion of the genera of GIT nematodes identified was different in the current study. The Strongyles were the most prevalent than Parascaris equorum, Oxyuris equi and Strongyloides equorum. This agrees with report of Regassa and Yimer [16] in South Wollo Zone with 74.9% of strongyles in both species, Bewketu et al. [23] with 65.09% in donkeys and Saeed et al. [24] with 65.51% in horses. This the fact that higher infections of strongyles correspond with the biology and epidemiology of these parasites as they require longer period to complete the life cycle and significant change in worm population and their burden under different anthelmintic pressures over the years [21].

The prevalence of Strongyles in the present study (74.9%), which was lower than the reports of Wondamu and Sharew [25], with 84.47% and 98.22% in horses and donkeys respectively in Gondar town, Ayele et al. [19] who reported 100% prevalence in donkeys at Dugda Bora District and Getachew et al. [26] who reported 99% prevalence in working donkeys of Ethiopia. This may be due to the presence of different geographical and climatic
conditions between the study area and deworming practices with effective drugs are routinely undertaken. This study showed that the level of Strongyles infection had significant variation between the age and body condition scores.

The prevalence of *P. equorum* (7.4%) recorded in the current study is lower than the previous reports of Fikru *et al.* [20], Ayele *et al.* [19] and Zeriuhun [27] who reported 43%, 17.3% and 42.8% in Western highlands of Oromia, Dugda Bora district and highlands of Wollo provinces, respectively. These differences in prevalence might be due to the variation in the length of the study period, the season of the study period, ecology of the study area, intervention with anthelminthic (deworming) and the ecological and climatic differences among localities.

The prevalence of *P. equorum* was significantly (P<0.05) in young horses and donkeys. This is most probably due to the fact that young have less immunity against *P. equorum* infection than both adult and old donkeys. This agrees with the works of Getehun and Kassa [28] in Tenta woreda and Zeriuhun [27] in central Showa, Ethiopia. However, this finding contrast the research of Ayele *et al.* [18] and Getachew *et al.* [26] who reported absence of statistically significant differences in the prevalence of *P. equorum* among donkeys of different age groups that may reflect differences in the study design and geographic locations. The current study also showed that the level of *Parascaris equorum* infection had significant variation between sex and body condition score. These present significant variations oppose the finding of Robera *et al.* [29] on horses in and Around Ambo Town, Central Ethiopia. This difference might be due to Climatic variations, pasture and stable management [20].

*Oxyuris equi* with prevalence rate of 3.4% was lower when compared with the work of Yoseph *et al.* [30] in Wonchi who reported 32.4%. The differences in prevalence of infection might be due to variations in the management given to these animals and variations in parasite biology relating to climatic conditions. The current finding of this rate of infection relatively similar to Getehun and Kassa [28] in Tenta woreda and Alemaryehu and Etaferahun [31] in south wollo zone, reported with this prevalence of 6.5% and 4% respectively. The low prevalence of *O. equi* in this study might be the effect of deworming by the woreda veterinary clinic, variation in management system and relatively dry season during sample collection time in the present study area which desiccates the highly susceptible *O. equi* eggs. The parasite is ubiquitous but greater prevalence in areas of high rainfall [32].

The prevalence of *Strongyloides westeri* show statistically significant variation between the age and sex. The prevalence of *Strongyloides westeri* in this study area, 2.7% in donkeys and 3.7% in horses is lower than the report of Guye *et al.* [33] with the prevalence of 9.4% in gastrointestinal of working donkeys in Dodola District and Getachew *et al.* [26] with the prevalence of 11% in gastrointestinal of working donkeys in Ethiopia. This difference is arising from variation in environmental temperature and humidity since warm and moistures favor their development.

CONCLUSION AND RECOMMENDATIONS

The result of the current study indicates the presence of high prevalent gastrointestinal (GIN) parasites in donkeys and horses in and around Sagure town. The major finding from the study revealed that the common GIN parasites affecting the horses and donkeys in the area were strongyles, *Strongyloides westeri, Parascaris equorum* and *Oxyuris equi*. Mostly the disease affect young animals having poor and medium body condition animals due to the inadequate development of the immune system in young animals as well as their grazing habit and feeding condition of the medium body animals and use of the animals for longer period of time during working hours. In addition, absence of control strategic against invading parasite, poor management practice and the presence of favorable climatic situation for the development of this parasite in the study area are some of the conditions which predispose the horses and donkeys for such type of parasites. The highest prevalence of GIT parasites in the study area was a serious threat to the horses and donkeys; hence, an immediate professional’s intervention is required in the study area.

Based on the above conclusion the following recommendations are forward.

- Education and awareness creation for farmers with regards to the epidemiology of parasitic diseases. They should be taught the best parasite control strategy and management practices through extension.
- Strategic and regular anthelmintic treatment of equine population.
- Further research on the economic importance, epidemiology and time of treatment of GIN parasites of horses and donkey in the study area is recommended.
REFERENCES