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Prevalence of Gastro Intestinal Nematode Parasitic Infections of Horses and Donkeys in and Around Kombolcha Town

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Abstract: A cross sectional study was conducted from November 2014 to April 2015 in and around Kombolcha town to know the prevalence of gastrointestinal (GIT) nematode parasites in donkeys and horses. A total of 384 donkeys and horses (253 donkeys and 131 horses) were randomly selected and examined during the study period. During the examination, floatation technique was used and the overall prevalence of gastrointestinal nematode parasites was 76.04% (292 from 384) with 86.5% in donkeys and 55.7% in horses. The prevalence of *Strongyle*, *Parascaris equorum* and *Oxyuris equi* was 47.4%, 4.7%, 2.8% in donkeys and 36.6%, 6.9% and 3.1% in horses respectively. There were also mixed infestations like *Strongyle* and *Parascaris equarum*, *strongyle* and *Oxyuris equi, strongyle, Parascaris equi* and *Oxyuris equi* with total prevalence of 12.5%, 5.5% and 6% respectively. The risk factors, species, sex, age, body conditions and origins having respective p-values of 0.000, 0.037, 0.028, 0.009 and 0.000 were significantly associated with the occurrence of GIT Nematode parasites. Donkeys were found more likely at risk of developing GIT nematode parasites than horses (OR = 5.1, 95% CI = 3.1-8.4). The age related prevalence was 85.1%, 71.77%, 80% respectively for young, adult and old ages while 70.2%, 81.3% and 64.4% prevalence was for poor, medium and good body mass conditions respectively. In conclusion, the current study revealed higher prevalence of GIT nematode parasites of horses and donkeys in the area. Therefore, regular deworming, improvement of housing and feeding management systems and awareness creation to animal owners were recommended.

Key words: Donkeys · GIT Nematode parasites · Horse · Kombolcha · Prevalence · Risk fact

INTRODUCTION

In the developing countries, there are estimated 110 millions of equines. Ethiopia has a large numbers of equines. It has a total of 9.83 millions equine populations. From those numbers, donkeys accounts 7.04 million while horses and mules are 2.03 and 0.4 million respectively [1]. Equines have a prominent position in the agricultural systems of many developing countries. 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 [2]. In Kombolcha, which is found in south wollo zone administration, there are both horses and donkeys. Horses in the area are all cart horses in the town while donkeys are found around the town.

Equines play an important role as working animals in many parts of the world, employed for packing, riding, carting and ploughing. Equine power is vital for both rural and urban transport system which is cheap and provides 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. It is suggested that donkeys can play a great role in the frame works of food security and social equity of high food insecure countries [3].

In areas away from roads, many people use mules and donkeys to transport food and other supplies to villages. Long working hours and difficult conditions are experienced by donkeys and mules. These animals are often engaged in work for long hours and when get free,

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they are left to browse and feed on garbage. These have the potential to affect negatively on their welfare of life and health [4].

Parasitic helminthes are one of the most common factors that constrain the health and working performance of donkeys and horses world widely. They cause various degrees of damage depending on the species, nutritional and the immune status of equines. They decrease the performance 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 [5].

Equines are hosts to great nematodes of the family *Strongylidae,* commonly called *Strongyle* nematodes or *Strongyles*. The most common gastro intestinal nematode parasites of equines include large *strongyles*, small *strongyle*, *Ascaris* and pinworms (*Oxyuris equi)* [6]. Some studies were conducted in the town in horses. But, this current study includes both donkeys and horses.

The Objectives of the study are:

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

MATERIALS AND METHODS

Study Area: A cross sectional study was conducted from October, 2014 to April, 2015 in and around Kombolcha town, Ethiopia. Kombolchais acity andworedain north-centralEthiopia, in Amhara National Regional State, South Wello Zone, at a distance of 13km to the north west of Dessie, 377 Km from Addis Ababa and 505 Km from Bahirdar. It has a latitude and longitude of11°5'N39°44'Ewith an elevation between 1842 and 1915 meters above sea level with average annual temperature of 15.9 °C and average annual rainfall of 1248 mm. There are 2540 horses, 634 mules, 7758 donkeys and 1865 camels [7].

Study Population: The study was conducted on both horses and donkeys. These animals were found from different areas of Kombolcha towns and its surroundings.. The animals were housed in houses with muddy grounds roofed with either hay or corrugated iron. Strategic de-worming was not practiced by the farmers of the area. But, cart horses in the town get occasional de-worming than around the town.

Study Design: A cross sectional study was conducted in randomly selected horses and donkeys for the detection of the prevalence of gastro intestinal Nematode parasitic infections. Information about species, sex, age and body conditions of the study animals were gathered appropriately. The ages were determined using owners' information. Animals were categorized as young (< 4 years) adult (4-9 years), Old (> 9 years). The body conditions were classified according to Svendsen [8] as poor, medium and good.

Sample Size Determination: The sample size required for this study was determined according to Thrusfield [9]. Since there was no previous work done in this study area, 50% prevalence was taken as expected prevalence for sample size determination of this study. The other determinants considered in sample size determination were 95% confidence interval and 5% desired absolute precision. Hence the sample size is estimated as

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

where;
N = Required sample size
P_{exp} = Expected prevalence of nematode parasites
d^2 = Desired absolute precision
1.96 = The value of "z" at 95% level of confidence
d =5%=0.5

$$N = \frac{1.96^2\ 0.5(1\text{-}0.5 = 384)}{(0.5)^2}$$

Usingtheaboveformula,384 animals of Horses and Donkeys were examined.

Study Methodology: Random fecal samples were collected directly from the rectum of the study animals using disposable plastic gloves and placed in into universal bottles. Each sample was labeled with necessary information and immediately transported to Kombolcha Animal disease diagnosis Laboratory. 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. Parasitological examination was done by direct smear and flotation techniques [20] following the standard procedures for nematode parasites and examined microscopically (10× and 40×). Identification of the eggs was made based on the basis of their morphology [21].

Data Collection: The data were collected by simple random method by taking horse and donkeys that originate from Kombolcha and its surroundings. The fresh fecal samples were collected from the rectum of the horses and donkeys.

Data Management and Analysis: The collected data were coded and entered into Microsoft Excel spread sheet and Statistical analyses was performed using SPSS version 16 software packages. Descriptive analysis was made to know the chi square and prevalence described as percentages. Univariate and multivariate logistic regressions were used to know the significance and to calculate degree of association between risk factors and GIT nematode parasites.

RESULTS

The Overall Prevalence of Git Nematodes of Donkeys and Horses: 384 fecal samples were taken from 131 horses and 253 donkeys and examined for the presence of different gastrointestinal nematode parasites. From the examined animals, 73 horses and 219 donkeys were positive with respective prevalence of 55.7% and 86.5% for different GIT nematodes. The overall prevalence of GIT nematode in horses and donkeys in the study area was found to be 76.04%.

The logistic regression analysis of the risk factors indicated the presence of strong association between the occurrence of GIT nematodes infections and among the species of animals, ages, body conditions, sexes and animal origins. Sex, age, species, body conditions and origins with their respective p-values of 0.037, 0.027, 0.000, .009 and 0.000 are all significantly associated with the risk of being infected with GIT nematodes. Donkeys were found 5.1 times more likely at risk of developing gastrointestinal nematode parasites than horses (OR = 5.1).

The risk of being infected for male is 1.65 times more likely than females (OR=1.65). Youngs are 1.4 times more likely infected than olds while adults are 0.63 times less likely infected than olds. Poor and medium body conditions respectively are1.3 and 2.4 times more likely infected than good body mass conditions. Donkeys and horses from the origins of Ancharo, Chefew, Dirma and Kombolcha cart stations are less likely infected from origin Ligo respectively by 0.43, 0.36, 0.29 & 0.079 times.

Relative Proportions of Each Gastro Intestinal Nematode Parasites: During the laboratory examinations, different GIT Nematodes eggs were found. These were *strongyles, parascaris equi, Oxyuris equi* and mixed infections of *Strongyle + parascaris equi*, *strongyles + Oxyuris equi* and *strongyles + parascaris equi + Oxyuris equi.*

Table 1: Over all prevalence of gastro-intestinal nematode parasites in donkeys and horses.

Animals	Numbers of animals examined	Numbers of positive animals	Prevalence	x^2	P-value
Donkey	253	219	86.5%		
horse	131	73	55.7%	45.04	P=0.000
Total	384	292	76.04%		

Table 2: Analysis results of different risk factors

Risk factors	Numbers of Examined animals	Numbers of positives and prevalence	X^2	P-value	OR(95% CI)
Species			45.0	0.000	
Donkeys	253	219 (86.6%)			5.1(3.1-8.4)
Horses	131	79 (55.7%)			
Sex			4.40	0.037	
Males	236	188 (79.7%)			1.65(1.01-2.6)
Females	148	104 (70.2%)			
Age			7.37	0.028	
Youngs	101	86 (85.1%)			1.4(1.23-3.8)
Adults	248	178 (71.77%)			0.63(0.26-0.89
Olds	35	28 (80%)			
Body conditions			9.75	0.009	
Poor	94	66 (70.2%)			1.30(1.15-2.60)
Medium	231	188(81.3%)			2.41(1.29-4.5)
Good	59	38 (64.4%))			
Origins			48.30	0.000	
Ancharo	62	54 (87.1%)			0.43(0.10-0.75)
Chefew	74	63 (85.13%)			0.36(0.02-0.48)
Dirma	68	56 (82.35%)			0.29(0.07-0.68)
Kombolcha cart stations	130	72 (55.38%)			0.07(0.02-0.09)
Ligo	50	47 (94%)			

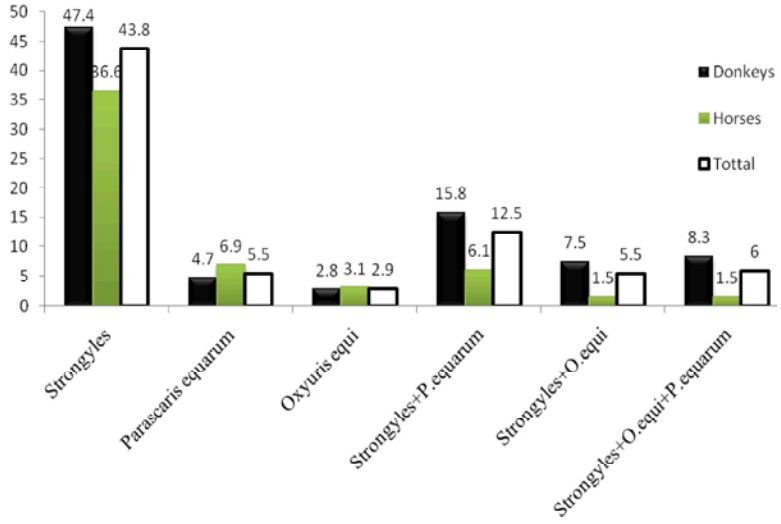

Fig. 1: Proportions of each gastro-intestinal nematode parasite of donkeys and horses in%

Table 3: Proportions of each gastro intestinal nematode parasites with each risk factor

Risk factors	Numbers of examined	*Strongyles* Positives /%/	*Parascaris equarum* Positives /% /	*Oxyuris equi* Positives /% /	*Strongyle + P. equarum* Positives /% /	*Strongyle + Oxyuris equi* Positives /% /	*Strongyle+P.equarum+Oxyuris equi* Positives /% /
Species							
Donkeys	253	120 /47.4% /	12 / 4.7% /	7 / 2.8% /	40 / 15.8% /	19 / 7.5% /	21 / 8.3% /
Horses	131	48 / 36.6% /	9 / 6.9% /	4 / 3.1%	8 / 6.1% /	2 / 1.5%	2 / 1.5% /
Sex							
Female	148	63 / 42.6% /	7 / 4.7% /	5 / 3.4% /	20 / 13.5% /	5 / 3.4% /	4 / 2.7% /
Male	236	105/ 44.5% /	14 / 5.9% /	6 / 2.5% /	28 / 11.9% /	16 / 6.8% /	19 / 8.1% /
Ages							
Young	101	45 / 44.6% /	5 / 5% /		15 /14.9% /	8 / 7.9% /	8 / 7.9% /
Adult	248	109 / 44% /	14 / 5.6% /	5 / 2% /	30 / 12.1% /	9 / 3.6% /	11 / 4.4% /
Old	35	14 / 40% /	2 / 5.7% /	1 / 2.9% /	3 / 8.6% /	4 / 11.4% /	4 / 11.4% /
Body conditions							
Poor	94	35 / 37.2% /	6 / 6.4% /	5 / 5.3% /	5 / 5.3% /	5 / 5.3% /	5 / 5.3% /
Medium	231	117/ 50.6% /	12 / 5.2% /	2 / 0.9% /	15 / 6.5% /	11 / 4.8% /	15 / 6.5% /
Good	59	16 / 27.1% /	3 / 5.1% /	4 / 6.8% /	3 / 5.1% /	5 / 8.5% /	3 / 5.1% /
Origins							
Ancharo	62	31 / 50% /	2 / 3.2% /	1 / 1.6% /	7 /11.3% /	5 / 8.1% /	8 /12.9%/
Chefew	74	39 / 52.7% /	5 / 6.8%/	2 /2.7%/	7 /9.5% /	5 / 6.8% /	5 / 6.8% /
Dirma	68	22 / 32.4% /	5 / 7.4% /	2 / 2.9% /	18 / 26.5% /	5 / 7.4% /	4 / 5.9% /
Kombolcha cart stations	130	47 / 36.2% /	9 / 6.9% /	4 / 3.1% /	8 / 6.2% /	2 / 1.5% /	2 / 1.5% /
Ligo	50	29 / 58%/	0	2 / 4% /	8 / 16% /	4 / 8% /	4 / 8% /

The highest percentage was recorded for *Strongyles*, followed by mixed infections of *Parascaris equorum* + *Strongyles*, *Strongyles* + *Parascaris equarum* + *Oxyuris equi*, *Parascaris equarum*, *Oxyuris equi* + *Strongyles* and *Oxyuris equi* with their respective prevalence of 168 (43.5%), 48 (12.5%), 23 (6%), 21 (5.5%), 21(5.5%) and 11(2.9%) (Figure 1).

Proportions of Each Gastro Intestinal Nematode Parasite with Risk Factors: The highest prevalence of all the parasites was observed for *strongyles* infections in both species of donkeys (47.4%) and horses (36.6%) followed by mixed infections of *Strongyle + Oxyuris equi* (19 / 7.5% /) in donkeys and *Parascaris equarum* (9 / 6.9% /) in horses. *Strongyle + P. equarum + O. equi* (21 / 8.3% /), *Strongyle + Oxyuris equi* (40 / 15.8% /), *Parascaris equarum* (7 / 2.8% /) for donkeys and *Strongyle + P. equarum* (8 / 6.1% /), *Oxyuris equi* (4 / 3.1% /), *Strongyle + Oxyuris equi* (2 / 1.5% /) *and Strongyle +Parascaris equarum+Oxyuris equi* (2 / 1.5% /) for horses held their respective ranks in each species.

Strongyles (105 / 44.5% /), *P.equarum* (14 / 5.9% /) and *Strongyle + Oxyuris equi* (16 / 6.8% /), have their highest prevalence in males while *O. equi* (5 / 3.4% /) and *Strongyle + P. equarum* (20 / 13.5% /) are in females. *Strongyles* are high in prevalence in youngs (45 / 44.6% /) followed by adults (109 / 44% /) and olds (14 / 40% /), *Parascaris equarum* has highest prevalence in old

(2 / 5.7% /) followed by adults (14 / 5.6% /) and youngs (14 / 5.6% /). *O. equi* accounts 5 / 5% /, 1 / 2.9% / and 5 / 2% / value respectively for youngs, olds and adults.

Strongyles showed highest prevalence in medium body conditions (117/ 50.6% /) followed by poor (35 / 37.2% /) and good BCS (16 / 27.1% /). *P. equarum* held high prevalence in poor body conditions (6 / 6.4% /) followed by medium (12 / 5.2% /) and good body mass (3 /5.1% /) while *O. equi* has prevalence of 4 / 6.8% /, 5 / 5.3% /, 2 /0.9% / respectively for good, poor and medium body mass conditions. *Strongyle* infections accounted highest prevalence for those around Ligo (29 / 58%) while *P. equoarum* in Dirma (5 / 7.4% /) and *O. equi* in Ligo (2 / 4% /) (Table 3).

DISCUSSIONS

In this current study, an overall of 76.04% prevalence of nematode parasites with 55.7% in horses and 86.5% in donkeys were obtained. This result (76.04%) agrees with the works of Tesfu *et al*. [10] in Hawassa Town and Regassa and Yimer [11] in South wollo zone with their respective results of 72.7% and 70.4%. This present finding is higher than the work of Sawsan *et al*. [12] who reported with a prevalence of 29.79% of horse and 37.48% of donkeys in South Darfur state. But, it is relatively lower than reports of Mezgebu *et al*. [5], Ibrahim *et al.* [13] and Ayele *et al.* [14] with their respective results of 92.71%, 96.9% and 98.2% for GIT helminthes parasite infection of equine at around Gondar, around Hawassa Town and Dugda Bora District, respectively.

This difference might be due to the differences in the study areas, deworming strategy and accessibility to veterinary clinic, nutritional status of the animal in the respective study area. It may also be due to the variation in sampling time, as seasonality affects the occurrence of the parasites.

In this study, relatively higher overall prevalence of GIT nematode parasites was recorded in donkey (86.5%) than horses (55.7%). This study agrees with the study of Tesfu *et al*. [10] and Regassa and Yimer [11] and Seri *et al*. [15] in Sudan with their respective results of 78.54%, 70.8% and 37.48%. This current prevalence in donkeys (86.5%) is higher than the work reported by Gizachew *et al*. [16] with overall results of 33% *of Parascaris* and *Strongyle* in donkeys in Central Shewa. Horse being infected with prevalence 55.7% of gastrointestinal nematodes agrees with the results reported by Worku and Afera [6] with overall prevalence of 52% of gastrointestinal nematodes in horses in Kombolcha town. But, it is lower than the result (63.7%) shown by Tesfu *et al*. [10] in Hawasa town.

This difference of high prevalence in donkeys might be due to the differences in feeding and deworming activities. Horses in this area are mostly used for cart pulling and they feed on grains and dewormed regularly than donkeys around the town that get less attention. The difference in prevalence in different area might be due to the difference in sampling area, feeding system and accessibility to deworming and health services.

The risk factors, species, sex, age, body conditions and origins with their respective p-value of (0.000, 0.037, 0.028, 0.009 and 0.000), are significantly associated with the infections of GIT nematode parasites. This agrees with the study of Tesfu *et al*. [10] having significance results for species and age with respective p-value (p=0.001, p=0.043). This also agrees with the study (p=0.000) of Worku and Afera [6] for both age and body conditions on the study of GIT nematode parasites of horses in Kombolcha town and with the study of Mezgebu *et al*.[5] for species ($P< 0.05$) in Gondar.

This current study disagrees with the study of Hailu *et al*. [2] and Mezgebu *et al*.[5] who studied respectively in Arsi-Bale highlands of Oromiya Region and in and around Gondar Town. Both showed none significant results for age, sex and body conditions under the study of GIT helminth parasites in equine having $p > 0.05$. This result also disagrees with other studies which has got a none significant p-value (0.362, 0.726), respectively for sex and body conditions. This difference might be due to the difference in the study area, variation in sampling time as seasonality affects the occurrence of the parasites, nutritional status of the animal in the respective study area which can influence the level of immunity to be infected by the parasite, deworming strategy of equines and accessibility to veterinary clinic.

The relative percentage of GIT Nematode parasites reported in this current study indicated that *strongyle* was observed to have higher occurrence rate (43.8%) than other GIT Nematode parasites. This is in line agreement with the works of Worku and Afera[6] in Kombolcha town [17] in Nigeria, [11] in South wollo zone and (10) in Hawassa Town. The 43.8% prevalence of *Strongyles* in donkeys and horses in the current study is higher than the result (32.6%) shown by Worku and Afera [6] for horses in Kombolcha town. This prevalence is found to be lower than the result (75.26%) of Tesfu *et al*. [10] in Hawasa town, 100% prevalence at the highlands of Wollo

Province [18], Wonchi area [19] and Western highland of Oromia [3]. This current higher prevalence for *Strongyles* followed by mixed infections of Strongyle+*Ascaris*, also agrees with the result of Tesfu *et al*. [10].

This difference might be due to the prevalence done for this study for *strongyle* included its single occurrence alone. But it's much proportion found mixedly with other parasites *Ascaris* and *Oxyuris*. 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 [6].

The risk of being infected by GIT nematodes are found high in males (79.7%) than females (70.2%). This was indicated similarly by Regassa and Yimer [11] and Mezgebu *et al*.[5]. *Strongyles* (44.5%), *P.equarum* (5.9%) and *Strongyle* + *Oxyuris equi* (6.8%) have their highest prevalence in males while *O. equi* (3.4%) and *Strongyle* + *P. equarum* (13.5%) are highest in females. This agrees with the studies of Regassa and Yimer [11]. Highest prevalence in males might be due to cart horses in the towns which are all males graze following rivers where the area is moist and cold which create favorable conditions for the growth of the parasites.

The percentage prevalence of Strongyle species was also higher in younger ages. This result also agrees with the study shown by Tesfu *et al*. [10]. But, disagree with the results of Regassa and Yimer [11]which appears higher in olders. This current study showed GIT nematodes are highly prevalent in youngers (85.1%) followed by older ages (80%). This agrees with the study of Regassa and Yimer [11] having prevalence of 91.1% and 77.8% respectively for young and old ages. Higher infection rates and more severe infections indicate a lack of immunity in younger population [20].

P. equarum held high prevalence in poor body conditions (6 / 6.4% /) followed by medium (12 / 5.2% /) and good body mass (3 /5.1% /) while *Strongyles* showed highest prevalence in medium body conditions (117/ 50.6% /) followed by poor (35 / 37.2% /) and good BCS (16 / 27.1% /).These are in line with the study of Worku and Afera [6].

Conclusions and Recommendations: This current study showed high GIT nematode parasites prevalence in and around Kombolcha town. The major findings from the study were *strongyles, Parascaris equarum, Oxyuris equi* and mixed infections of these parasites. Donkeys were at higher risk of infestation than horses. Mostly, the disease affects adults followed by young and old ages. Equines having poor and medium body conditions are highly infected. Age, sex, species, body conditions and origins were the important risk factors for occurrence of gastro intestinal nematode parasites for these species. These risk factors were significantly associated with the occurrence of gastro intestinal nematode parasites. Donkeys in the area was highly infected since they feed by grazing and no care is given for deworming and supplementary feeding, while cart horses are dewormed regularly and feed grains rather than grazing.

Based on the above conclusions, the following recommendations are forwarded:

- Improvement of housing and feeding management system for equines are important.
- Public awareness creation to equine owners on proper regular deworming, sufficient feed supply and minimizing extensive open grazing are also important
- Balancing of the work load and duration should be managed.
- Regular and strategic deworming programmes with efficacious anthelminthics should be carried out regularly.
- All newly introduced animals into the herd must be quarantined and properly screened and treated to prevent environmental contamination with harmful helminthes parasites.

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