Epidemiological study of gastrointestinal helminths of equines in Damot-Gale district, Wolaita zone, Ethiopia

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Abstract The prevalence of equines helminthosis studied from November 2011 to May 2012 in two agroecological zones Damot-Gale district, Wolaita zone, Southern Ethiopia. The objective of the study was to estimate the prevalence, and to see the distribution of internal helminth parasites of equines. A total of 500 faecal samples collected for coprological examination of gastrointestinal helminth ova. From each species of studied animals 200 positive faecal samples were pooled and cultured, and then the larvae recovered and identified. The coprological examination revealed 100 % *Strongyle*, 16.6 % *Fasciola* species, 10.2 % *Parascaris equorum*, 2.1 % *Oxyuris equi*, 1.1 % *Strongyloides westeri*, and 0.7 % *Gastrodiscus* species in donkeys. The coproscopic examination of horse faeces revealed prevalence of 100 % *Strongyle*, 17.5 % *Fasciola* species, 5.5 % *Parascaris equorum*, 1.4 % *Oxyuris equi*, 0.5 % *Strongyloides westeri*. A statistically significant variations in the prevalence of equines helminthes were not observed among putative risk factors ($P > 0.05$), except in the case of *Parascaris equorum* and *Fasciola* species, in which statistical significant variations were observed with age and purpose of the animal, respectively ($P < 0.05$). The average egg per gram of faeces in this study was 689.8, with a range of 100–1,600 eggs per gram of faeces. Statistically significant variations in mean eggs per gram of faeces were observed in all the considered putative risk factors ($P < 0.05$), except in the case of sexes. The coproculture performed on 200 pooled faecal samples revealed that *Cyathostome* species, *Strongylus vulgaris*, *Trichostrongylus axei*, *Triodontophorus* species,

Strongylus equinus, *Strongylus edentatus* and *Oesophagodontus robustus* were the major helminth parasites of equines in Damot-Gale district, Wolaita.

Keywords Equine · Prevalence · Internal helminth parasites · Wolaita · Southern Ethiopia

Introduction

There are over 85 % of equids in developing countries where they are usually used for goods transporting, pack, cart, ridding, and traction in agricultural (Pritchard et al. 2005 and Gebreab 1998) or for ceremonial purpose (Charlotte et al. 2010). Ethiopia has an enormous livestock resources, currently estimates show that there are about 8.08 million equine species (FAOSTAT 2009). They are vulnerable to a variety of diseases like parasitic, bacterial, viral, nutritional diseases and miscellaneous causes. The effects of parasitism on them include: anorexia and reduced feed intake, loss of blood and plasma proteins into the gastrointestinal tract, alterations in protein metabolism, depressed level of minerals activities of some intestinal enzymes and diarrhea all contributes to depressed weight gain and retardation in traction power (Radostits et al. 2007 and Gebreab 2003). Gastrointestinal parasitism identified as one of the most important problems for equids in developing countries (Pereira and Vianna 2006). Studies conducted in Ethiopia and Mexico estimate the prevalence of endoparasite infections at over 90 % in horses (Fikru et al. 2005; Valdez- Cruz et al. 2006; Gebreab 1998) and over 80 % in donkeys (Burden et al. 2010; Getachew et al. 2010; du Toit et al. 2008). In studies conducted in the northern and central parts of the country the commonly identified parasites include: *Strongyle*, *Cyathostomes*,

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Triodontophorus species, *Strongyloides westeri*, *Parascaris equorum*, *Dictyocaulus arnfieldi*, *Oxyuris equi*, *Gastrophilus* and *Fasciola* species (Getachew et al. 2010; Ayele et al. 2006; Dersema 2006; Fikru et al. 2005; Yoseph et al. 2001). In the southern regional state no research work has done on equines helminthosis.

Therefore, this study was conducted with the objective of determining the distribution and prevalence of gastrointestinal helminth parasites of equines in selected areas of Wolaita zone, and the effect of putative risk factors in the distribution and prevalence of helminths parasites.

Materials and methods

Description of the study area

The study was conducted in Damot Gale district, which is in the northern central parts of Southern Nation's Nationalities and People's Regional State, Wolaita zone (Fig. 1). The altitudinal range of the study area is from 1,200 to 2,950 meter above sea level, and received average annual rainfall of 900–1,400 mm. The area is characterized with bimodal rainfall, which means the short rainy season, from mid of January to April, and long rainy season, from June to mid of October. The mean minimum and maximum temperature were 12 and 27 °C, respectively.

Study population, design and sample size

The study population was all groups and both sexes of equine population, horses and donkeys, in Damot-Gale district. A cross sectional study was undertaken from November 2011 up to May 2012 to identify and estimate the prevalence of equines internal helminths parasites and the associated risk factors. The sample size was determined based on the formula given by Thrusfield (2005). Due to lack of information on the prevalence of equine internal helminthes in the study area 50 % prevalence and 5 % desired absolute precision were taken to calculate the sample size. Accordingly about 500 animals were selected for the study.

Study methodology

Faecal samples were collected directly from the rectum of selected horses and donkeys. The samples were placed in universal sample bottle, labeled and then transported to Wolaita Sodo Regional Veterinary laboratory. A qualitative (i.e. by simple flotation and sedimentation) faecal examination was performed to search for helminth eggs. The faecal egg count was considered as a quantitative indicator of infestation and it was determined within the

day of sample collection by the modified McMaster technique (MAFF 1984).

Pooled faecal samples were collected from 200 positive horses and 200 donkeys, and cultured independently for horses and donkeys. The samples were cultured on a Petri dish at room temperature for seven days and then the third stage larvae recovered by the modified Baerman technique (Urquhart et al. 1996). The recovered third stage larvae were identified following the standard procedure described by MAAF (1991).

Data management and analysis

The FEC was considered as a quantitative indicator of infestation and prior to the analyses, the values were log transformed [using $\log(x + 1)$] to stabilize the variance. Descriptive statistics like mean and proportion were used to summarize the data, and *t* test used for the various analyses. For the analysis STATA version 11 software was used.

Results

Carporospical examination

A total of 500 faecal samples from 283 donkeys and 217 horses were examined for helminth ova. All the samples were found to be positive at least for one type of gastrointestinal parasite eggs, and hence, the overall prevalence was 100 % both for donkey and horse. The current study revealed the genera of helminthes shown in Table 1.

During this study species, sex, age, purpose of the animals and altitude were considered as putative risk factors. Higher prevalence of *Parascaris* species was recorded in donkeys, and younger equines. The prevalence of *Fasciola* species was higher in younger and pack equines. The results for all considered risk factors are shown in Table 2.

Degree of infection

The mean EPG for horse and donkeys were 641.5 and 726.9 respectively. The overall mean EPG of equines according to the level of infection: mild, moderate and severe level of infection was 300.5, 744.5, and 1186.3, respectively. About 42.4, 37.8 and 19.8 % of horses, and 32.9, 38.5 and 28.6 % of donkeys were infected mildly, moderately and severely respectively. Significantly higher mean EPG was recorded in donkey, young and pack equines, and also in equine of highland area (Table 3).

Table 1 Coprological overall prevalence of helminthes in donkey and horse in Damot-Gale district, Wolaita

Parasites genera	Examined animal species (<i>N</i> = 500)		
	Donkey (<i>n</i> = 283) (%)	Horse (<i>n</i> = 217) (%)	Total (%)
Strongyle	100	100	100
Parascaris	10.2	5.5	8.2
Strongyloides	1.1	0.5	0.8
Fasciola species	16.6	17.5	17.0
Gastrodiscus	0.7	–	0.4
Oxyuris	2.1	1.4	1.8

Table 2 Coprological prevalence of equine helminthes vs. considered risk factors

Risk factors	Strongyle (%)	Parascaris (%)	Strongyloides (%)	Fasciola (%)	Gastrodiscus (%)	Oxyuris (%)
Species						
Horse	100	5.5	0.5	17.5	–	1.4
Donkey	100	10.2	1.1	16.6	0.7	2.1
Sex						
Female	100	14.3	2.0	16.3	–	6.1
Male	100	7.5	0.7	17.1	0.4	1.3
Age						
Young	100	40.0	4.3	23.1	–	12.3
Adult	100	3.4	0.2	16.1	0.5	0.2
Animal purpose						
Cart	100	6.0	–	12.0	–	0.6
Pack	100	9.3	1.2	19.5	0.6	2.4
Altitude						
Highland	100	7.9	1.1	16.6	0.4	1.3
Midland	100	8.5	0.4	17.5	0.4	2.2

Table 3 Analysis for the variation in EPG vs. the considered risk factors (*t*-test was done after log transformation of the raw data)

Risk factor	Number examined	Mean EPG	Std E.	95 % CI	<i>t</i> -value	<i>P</i> -value
Species						
Horse	217	641.5	24.6	593.2–689.8	2.592	0.010
Donkey	283	726.9	22.0	683.6–770.1		
Sex						
Female	49	757.1	57.9	643.4–870.9	1.003	0.317
Male	451	682.5	17.2	648.8–716.2		
Age						
Young	65	963.1	40.0	884.4–1041.8	5.609	0.000
Adult	435	649.0	17.2	615.2–682.7		
Animal purpose						
Cart	167	578.4	26.7	525.9–631.0	5.034	0.000
Pack	333	745.6	20.2	706.0–785.3		
Altitude						
Midland	223	648.0	25.5	597.8–698.1	2.978	0.003
Highland	277	723.5	21.4	681.5–765.5		

Coproculture result

From each of studied equines species a total of 200 positive faecal samples were pooled and cultured. From horse 268 and donkey 287 third stage larvae recovered, and about seven species of parasites were identified both in horse and donkey (Table 4) Fig 1.

Discussion

Coprologically all examine horses and donkeys were found to be positive at least for one type of helminth regardless of sex, age, animal purpose and altitude. This finding is in line with the work of Ayele et al. (2006); Mulate (2005); Yoseph et al. (2001) who have reported 100 % strongyles

infections in donkeys. Other studies also reported very high prevalence of strongyles, between 90 and 100 % (Abeba et al. 2011; Asefa et al. 2011; Ibrahim et al. 2011; Ayele and Dinka 2010; Getachew et al. 2010; Fikru et al. 2005; Gebreab 1998). Hence, this study clearly indicated that gastrointestinal helminths infection was highly prevalent in equine species in Wolaita, southern Ethiopia.

The prevalence of *Parascaris equorum* was significantly higher in younger equines ($\chi^2 = 100.367$, $P = 0.000$, 95 % CI was 28–52 and 1.7–5.2 % for younger and adult equines respectively). This finding is in line with Asefa et al. (2011); Ibrahim et al. (2011); Reinemeyer and Nielsen (2009); Zerihun (2008); Fikru et al. (2005); Gebreab (1998). This could be due to the development of immunity with increasing of age (Hendrix 1998; Urquhart et al. 1996). According to Reinemeyer and Nielsen (2009) horses develop an excellent

Table 4 Table to show the proportion of larvae type found by coproculture

Type of larvae	Proportion in examined animal species		Overall ($N = 555$) (%)
	Horse ($n = 268$) (%)	Donkey ($n = 287$) (%)	
<i>Strongylus vulgaris</i>	27.2	21.6	24.3
<i>Triodontophorus species</i>	18.3	13.2	15.7
<i>Strongylus equinus</i>	1.1	3.1	2.2
<i>Strongylus edentatus</i>	8.6	0.3	4.3
<i>Trichostrongylus axei</i>	12.3	19.5	16.0
<i>Cyathostomes species</i>	24.6	27.5	26.1
<i>Oesophagodontus robustus</i>	7.8	14.6	11.4

Fig. 1 Map to show study district

acquired immunity to *Parascaris equorum* infection. The prevalence of *Parascaris equorum* was higher in female equids (14.3 %) than in males (7.5 %), but the difference was not statically significant (95 % CI was 4.4–24.2 % and 5.1–10.0 % for female and male respectively, $P = 0.102$). This can be justified by the fact that females have a close relation to their foals, which favors frequent recycling of the parasite between the dam and foal.

The prevalence of *Fasciola* species was significantly higher in pack than the cart equids (95 % CI 7.0–16.9 % and 15.2–23.8 % for cart and pack equines respectively, $\chi^2 = 4.486$, $P = 0.034$). This could be accounted to the variation in the management and feeding system by the owners. The pack equids were mostly allowed to graze freely after work, but the cart equids at least partially supplemented. Hence, the probability of exposure to radiae and cercariae is higher in pack equids, the free grazing.

The overall prevalence of *Oxyuris equi* was 1.8 %, its prevalence in donkeys and horses were 2.1 and 1.4 % respectively. This finding is a generally agreement with others report from various parts of the country (Dersema 2006; Getachew et al. 2010; and Fikru et al. 2005). Even though, statistically there was no significant difference, the prevalence of *Oxyuris equi* found to be higher in female (6.1 %), younger (12.3 %) and pack (2.4 %) than male (1.3 %), adult (0.2 %) and cart (0.6 %) equids. Basically, *Oxyuris equi* is the parasite of younger equids (Khan and Line 2005), and since there is close relationship between the dam and foal it could be higher in female equids.

The mean EPG was significantly higher in donkeys (95 % CI 683.6–770.1, $t = 2.592$, $P = 0.010$), younger (95 % CI 884.4–1041.8, $t = 5.069$, $P = 0.000$), pack equids (706.0–785.3, $t = 5.034$, $P = 0.000$) and highland (95 % CI 681.5–765.5, $t = 2.078$, $P = 0.003$) than in horses, adult, cart equids and midland respectively. Asefa et al. (2011) and Yoseph et al. (2005) also reported higher FEC in younger donkeys. This difference accounted to the fact that donkeys in Ethiopia are subjected to poor nutrition and heavy workload than horses, and most of the donkeys were used for heavy goods pack purpose (Gebreab et al. 1997). Also it is related with the difference in the management system, donkeys after work mostly left to graze with ruminants. This should create a favorable situation for parasitic infection. This study result showed higher mean EPG in younger equids than the adult. This is generally related to the increased development of immunity to helminths with age. Following infections equids acquire resistance to gastrointestinal parasites infections, and hence through the development of immunity influences ova shedding (Klei and Chapman 1999). The highland areas are more appropriate and ideal environment for parasites, and hence there could higher infection rate that could result in higher eggs shedding (Urquhart et al. 1996; Soulsby 1982).

The coproculture and larval identification (L_3) showed seven species of helminth parasites: *Strongylus vulgaris*, *Cyathostome* species, *Trichostrongylus axei*, *Triodontophorus* species, *Strongylus edentates*, *Strongylus equines* and *Oesophagodontus robustus*. The most commonly encountered helminth parasites were *Cyathostome* specie (26.1 %), *Strongylus vulgaris* (24.7 %), *Trichostrongylus axei* (16.0 %) and *Triodontophorus* species (15.7 %). This result is in line with the finding of Gebreab (1998) and Dersema (2006).

Conclusion

In conclusion, strongyle infection is found to be highly prevalent in equids of Damot-Gale district, Wolaita, with an overall coproscopic prevalence of 100 %. The copro-cultured examination revealed seven different types of helminth parasites of equines in the study areas, namely *Strongyles*, *Parascaris equorum*, *Strongyloides westeri*, *Fasciola* species *Gastrodiscus* species and *Oxyuris equi*. *Parascaris equorum* and *Oxyuris equi* were found to be mostly a problem of young equids and nursing dams.

Helminth parasites of equines particularly around Wolaita, and generally in Ethiopia, should be addressed with in the broader responsive context and professionals should pay more attention to the problem. Measures to protect younger animals may be appropriate. Awareness creation among the community concerning the equine welfare, especially the health condition of equines is necessary. Further study of the epidemiological pattern, treatment and control strategies of equines parasitic infection should be done.

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