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Prevalence of Gastrointestinal Helminthes Parasite of Cattle in Ejere District, West Shoa, Oromiya Region, Ethiopia

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Abstract: A cross sectional study on prevalence of gastrointestinal helminthes parasites of cattle was conducted from November, 2014 through April, 2015 in selected sites of Ejere district, Ethiopia. A total of 480 cattle's (273 female and 207 male) faecal samples were collected for GI helminthes examination. Of these, 54.2% (n=260) were found to be harbor GI parasite eggs in their feaces (54.23% female and 45.77% male). High GI helminthes parasites were observed in Iluaga and the least were in Dhamotu peasant association ($P<0.05$). *Fasciola* spps. (17.0 % (n=67)), *Paramphistomum* spps. (11.9% (n=47)), *Ascaris* (10.1% (n=40)), *Trichostrongyle* (9.1% (n=36)), *Toxocara* spps. (7.3% (n=29)), *Trichuris* spps. (6.6% (n=26)), *Nematodirus* (6.3% (n=25)) and *Monezia* 5.6% (n=22) takes the highest prevalence rate of parasites respectively. Shedding of GI helminthes eggs were higher in cattle with poor body conditions and adult age groups (>3 years) ($P<0.05$). Generally, age, poor body condition and poor management system were the most important factors affecting the prevalence rate of the parasites in the study area. Thus, strategic anthelmintic treatment with appropriate drugs before and after rainy seasons, improve the management system of the cattle and integrated fluke control measures like drainage, fencing and molluscides should be practiced.

Key words: Ejere · GI helminthes · Prevalence · Cattle · Parasites

INTRODUCTION

Prevalence of helminthes parasites of cattle particularly gastrointestinal nematode and trematode are adversely affecting the cattle, causing hematological and biochemical disturbances, anorexia, weight loss, stunted growth, poor reproductive performance and even death of animals in developing countries [1]. Most of the losses caused by GI helminthes are brought by stomach and intestinal worms that do have its own detrimental effect on all groups of animals [2]. These groups of parasites are widespread in almost all tropical and sub-tropical countries and are considered as responsible factors for deteriorating animal health and productivity [3]. For example, *Haemonchus contortus* and other genera/species of nematodes belonging to the group of *Trichostrongylids* are of the major concern because of its blood-sucking feeding habits which causes anemia and resulting in the death of animals [4]. Additionally, there are Eimeria (internal protozoa parasites), *Moniezia expansa* (Tapeworms), Fasciola spps. (liver flukes) parasites which can be transmitted when an animal eats grass or drinks water contaminated with their larva or eggs [5].

Ethiopia has the highest livestock population than any African countries [6]. The studies show that the country has about 52.1 million heads of cattle, 24.2 million sheep, 22.6 million goats and 44.9 million poultries [7, 8]. The sub-sector is playing a vital role in the economy of the country which contributes about 10% of GDP and provides employment to over 30% of the agricultural labor force [9, 10]. The animal production systems are extensive, semi-intensive and intensive [6, 10, 11].

In spite of having these all resources, full exploitation of cattle potential is mainly constrained and impeded at a great extent by parasitic diseases [10, 12, 13]. However, little attempts have been made in the past to study the health aspect of these animals. Lack of well-established data on the magnitude, distribution and predisposing factors of cattle on GI helminthes is being observed as the

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major problem in most part of the country. Therefore, here we aimed to identify the major gastrointestinal helminthes parasites, their prevalence and associated risk factors that might mitigate their prevalence status in the cattle in Ejere district, West Shoa zone, Ethiopia.

MATERIALS AND METHODS

Description of the Study Area: The study was conducted in Ejere district from November, 2014 through March, 2015. Ejere district is located on 40kms away from Addis Ababa toward the west direction, in West Showa zone, Oromiya regional state, Ethiopia. Elevation of the area range from 2060-3185 m a.s.l. It lies between the coordinate of 38°15'E-38''30'E latitude and 9°0'0''-9°15''N longitudes. The area receives between 900-1200mm annual rain fall and have mean annual temperature ranges from 22-28°C. The climatic condition of the area is divided into highland (45%) and mid land (55%) condition. The district covers about 56918 hectares of land and had about 99, 062 population sizes. In addition, the district has about 95, 786 heads of cattle, 37, 423 sheep, 11, 600 goats, 20, 409 equidae (horse, donkey and mules) and 54, 760 poultry population. Mixed farming system is a common activity in the district [14].

Study Design and Study Population: Ejere district has 27 peasant associations. From these peasant associations, four peasant associations were selected purposely based on their climatic conditions. Two peasant associations (Iluga and Dhamotu) were selected from highland climatic condition and two peasant associations (Kimoye and Chiri) were from midland climatic condition. Additionally, the peasant associations were selected because of their high cattle head. A cross-sectional study using random sampling procedures were used to select the cattle. The study population included both indigenous (283l) and cross (112) breeds of different age, sex and body condition categories of cattle. The ages of the cattle were estimated based on the owners' response and by looking to the dentition pattern of the cattle [15]. Then, they were grouped as calf (less than one year), young (between 1 and 3 years) and adults (> 3 years) based on Frandson [16] classification methods. Body condition scores were made according to Morgan *et al*. [17] and Nicholson and Butter [18] method.

Sample Size Determination: The sample size was calculated based on the following Thrusfield [19] formula.

$$n = \frac{1.96^2 (P_{exp})(1 - P_{exp})}{D^2}$$

Where n =sample size required
P_{exp}=expected prevalence (50%)
D =desired level of precision (5%)

Based on this formula, 384 cows were selected from four different peasant associations (PA) based on 50 % estimated prevalence and a 95 % confidence interval (CI) at a desired precision level of 5 %, since the prevalence of GI helminthes parasites in the study area was unknown. To minimize sampling error during sample collection, 25% of the estimated values (96 cattle) were added as contingency for missing data. Totally, 480 cattle were taken as a minimum sample size.

Faecal Sample Collection: A fresh faecal sample of approximately 10 g was collected directly from the rectum of cattle or during defecation with strict sanitation using gloved arm. The collected faecal samples were placed in vials and labeled with animal identification, date and place of collection. The samples were preserved in 10 % formalin and transported to Holeta Agricultural Research institute, Laboratory of Livestock for further analysis [19].

Coprological Examination: The collected faecal samples were processed and examined by direct faecal smear, floatation and sedimentation techniques for qualitative investigation of GI helminthic eggs following the standard procedures of Hansen and Perry [5]. The floatation solution used was a saturated solution of sodium chloride [20]. Eggs of the different parasites were identified based on their morphological appearance and size under stereomicroscope [21, 22, 23]. Those samples which were not examined within 24 hours of arrival at laboratory were stored at +4°C and examined on the next day morning.

Data Analysis: All the collected data were entered to MS excel sheet and analyzed by using SPSS version 20. Descriptive statistics was used to determine the prevalence of the parasites and Chi-square test ($\chi 2$) was used to determine any association between the prevalence of GIT parasites with age, sex, breed and body condition. Chi-square test at $P<0.05$ (2-tailed) was considered as significant. Data were presented by table and graphically.

RESULTS

Overall Results: We examined a total of 480 cattle (n=480) where 56.87% (n=273) were females and 43.12% (n=207) were males. Of the total 480 cattle examined coprologically, 54.2% (n=260) were found to be harbored GI helminthes parasites eggs in their feces. Of these, 54.23% (n=141) were female and 45.77% (n=119) were male. Statistically, there is no significant difference of GI parasite infection among both sexes (P>0.05). Of the four peasant associations selected, the highest GI parasites prevalence was found in Iluaga (79.82% (n=99)), whereas the least prevalence rate was recorded from Dhamotu (43.80% (n=42)) peasant association (Table-1). Statistically, there is highly significant difference of GI prevalence among the peasant associations (P < 0.05).

Generally, eight genera of GI helminthes parasites were identified in this study. Of these, 17.0% (n=67) were *Fasciola* spp, 11.9% (n=47) were *Paramphistomum* spp, 10.1% (n=40) were *Ascaris*, 9.1% (n=36) were *Trichostrongyle* spps., 7.3% (n=29) were *Toxocara* spps., 6.6% (n=26) were *Trichuris* spps., 6.3% (n=25) were *Nematodirus* and 5.6% (n=22) were *Monezia* spps. Of the four selected sites of the study area, Ascaris was predominated highly in Kimoye while *Fasciola* and *Trichostrongyle* were highly prevalent in Chirri peasant association. In other words, high *Trichuris* was observed in Dhamotu peasant association where as high *Paramphistomum* and *Monezia* were observed in Iluaga (Table-2). However, there is no significant difference in species prevalence among the selected peasant association (P>0.005).

Table 1: Overall prevalence of GI helminthes with selected sites in Ejere district from November 2014 through March 2015

Selected sites	No. of examined cattle	No. of positive cattle	χ^2	P-value
Iluaga	124	99 (79.82%)		
Dhamotu	95	42 (43.80%)		
Chirri	153	56 (36.40%)	49.637	0.000
Kimoye	108	63 (58.60%)		
Total	480	260 (54.20%)		

Table 2: Respective prevalence of the individual genera of parasites among selected PA in Ejere district from November 2014 through March 2015

	Selected sites					
Genera of parasites	Iluaga	Dhamotu	Chirri	Kimoye	χ^2	p-value
Trichostrongyles	11 (2.8)	3 (0.8%)	13 (3.0)	9 (2.3%)	2.757	0.431
Toxocara	11 (1.5)	9 (2.3%)	3 (0.8)	9 (2.3%)	3.761	0.288
Nematodirus	5 (1.3%)	5 (1.3%)	7 (1.8)	8 (2.0%)	1.851	0.604
Ascaris	5 (1.3%)	1 (0.3%)	3 (0.8)	31 (7.8)	80.429	0.000
Trichuris	3 (0.8%)	11 (2.8)	5 (1.3)	7 (1.8%)	12.785	0.005
Fasciola	17 (4.3)	13 (3.3)	21 (5.0)	16 (4.1)	0.282	0.963
Paramphistomum	44 (11.1)	0 (0.0%)	2 (0.5%)	1 (0.3%)	1.264	0.000
Monezia	22 (5.6%)	0 (0.0%)	0 (0%)	0 (0.0%)	66.048	0.000

Table 3: Overall prevalence of GI helminthes parasites with respect to sex, age, breeds and body condition of cattle examined in Ejere district from November 2014 through March 2015

Risk factors		No. of animals examined	Positive animals	Percent (%)	χ^2	P value
Sex	Male	207	119	54.23%	0.01	0.976
	Female	273	141	45.77%		
Total		480	260	54.2%		
Age	< 1 Year	79	29	36.9%	10.2	0.006
	1-3 Year	148	80	54.1%		
	>3Years	253	151	59.6%		
Total	480	260	54.2%			
Breed	Local	344	186	54.1%	0.05	0.943
	Cross	136	74	54.5%		
Total		480	260	54.2%		
Body condition	Poor	129	121	94.3%	1.38	0.000
	Medium	115	78	67.4%		
	Good	236	61	25.8%		
Total		395	260	54.2%		

A higher prevalence rate was recorded in cattle with age >3 years (57.6% (n=151)) while the least prevalence was observed in <1 year age groups (36.9% (n=29)). There is highly significant difference in the prevalence of GI parasites among the different age groups (P<0.000). Another higher prevalence rate was revealed in animals with poor body condition (46.7% (n=121)) but, it was the least in cattle with good body conditions (23.4% (n=61)). The prevalence of GI parasites among different body condition scores were highly significant (P< 0.05). However, there is no significance difference observed between breeds of cattle statistically (P > 0.05) (Table-3).

The prevalence of *Fasciola* and *Trichostrongyles spps.* were identified as the first and second most dominant species in the study area (Table-4). The prevalence of all GI helminthes parasites were statistically non significant (P > 0.05) among the sex except for *Trichostrongyles* spp. (P<0.005).

Our result also reveals the high GI helminthes prevalence among the cattle with >3 years age groups. *Fasciola* and *Paramphistomum* spp. were the most prevalent GI helminthes observed among different age groups in study area (Table-5). However, the prevalence of all GI

Table 4: Relative prevalence of individual GI helminthes genera examined in cattle examined by sex categories in Ejere district from November 2014 through March 2015

	No. of positive in sex group			
Genera of GI helminthes	Male	Female	χ^2	P-value
Trichostrongyles	9 (2.3%)	27 (6.8%)	4.452	0.035
Toxocara	9 (2.3%)	20 (5.1%)	1.417	0.234
Nematodirus	11 (2.8%)	14 (3.5%)	0.068	0.795
Ascaris	19 (4.8%)	21 (5.3%)	0.656	0.418
Trichuris	11 (2.8%)	15 (3.8%)	0.007	0.933
Fasciola	32 (8.1%)	35 (8.7%)	1.295	0.255
Paramphistomum	21 (5.3%)	26 (6.6%)	0.220	0.639
Monesia	11 (2.8%)	11 (2.8%)	0.690	0.406

Table 5: Individual GI helminthes genera prevalence in age groups of cattle examined in Ejere district from November 2014 through March 2015

	No. of positive in age groups				
Genera of helminthes	< 1 Year	1-3 Year	>3Years	χ^2	p-value
Trichostrongyles	0 (0%)	14 (3.5%)	22 (5.6%)	7.877	0.019
Toxocara	4 (1.0%)	11 (2.8%)	14 (3.5%)	0.752	0.687
Nematodirus	3 (.8%)	10 (2.5%)	12 (3.0%)	1.150	0.563
Ascaris	11 (6.7%)	14 (6.1%)	25 (6.3%)	0.068	0.795
Trichuris	4 (1.0%)	12 (3.0%)	10 (2.5%)	3.185	0.203
Fasciola	8 (2.0%)	15 (3.8%)	44 (11.1%)	5.481	0.065
Paramphistomum	4 (1.0%)	17 (4.3%)	26 (6.6%)	2.600	0.272
Monezia	2 (.5%)	6 (1.5%)	14 (3.5%)	1.400	0.497

Table 6: Individual GI helminthes genera prevalence in breed of cattle examined in Ejere district from November 2014 through March 2015

	Breeds in positive animals			
Genera of GI helminthes	Local	Cross	χ^2	p-value
Trichostrongyles	9 (5.5%)	27 (11.7%)	4.452	0.035
Toxocara	23 (8.1%)	6 (1.5%)	0.905	0.341
Nematodirus	19 (4.8%)	6 (1.5%)	0.249	0.618
Ascaris	25 (6.3%)	15 (3.8%)	1.832	0.176
Trichuris	21 (5.3%)	5 (1.3%)	1.140	0.286
Fasciola	45 (11.4%)	22 (5.6%)	0.798	0.372
Paramphistomum	33 (8.4%)	14 (3.5%)	0.054	0.816
Monezia	18 (4.6%)	4 (1.0%)	1.187	0.276

Table 7: Individual GIT helminthes genera prevalence in body condition scores of cattle examined in Ejere district from November 2014 through March 2015

	No. of positive in body condition				
Genera of GI helminthes	Poor	Medium	Good	χ^2	p-value
Trichostrongyles	18 (4.6%)	13 (3.3%)	5 (1.3%)	20.323	0.000
Toxocara	14 (3.5%	8 (2.0%)	7 (1.8%)	9.499	0.009
Nematodirus	12 (3.0%)	10 (10.5%)	3 (.8%)	14.763	0.001
Ascaris	22 (5.6%)	13 (3.3%)	5 (1.3%)	26.626	0.000
Trichuris	10 (2.5%)	7 (1.8%)	9 (2.3%)	2.689	0.261
Fasciola	41 (10.4%)	15 (3.8%)	11 (2.8%)	53.150	0.000
Paramphistomum	32 (8.1%)	10 (2.5%)	5 (1.3%)	50.076	0.000
Monezia	9 (2.3%)	7 (1.8%)	6 (1.5%)	4.567	0.102

helminthes was statistically non significant among the age groups ($P > 0.05$) except for *Trichostrongyles spps*. ($P<0.005$).

The result also show that local breeds were more infected by GI helminthes than the cross breeds. *Trichostrongyles* and *Fasciola* spp. were the most prevalent GI helminthes genera observed in both breeds (Table-6). The prevalence of all GI helminthes parasites were statistically non significant among the breeds ($P > 0.05$) except for *Trichostrongyles spps*. ($P<0.005$).

Among the different body conditions, high prevalence of GI helminthes was observed in cattle with poor body conditions. There were highly significant difference ($P < 0.05$) in *Trichostrongyles* spp*, Toxocara, Nematodirus* spp*, Ascaris* spp*, Fasciola* spp and *Paramphistomum* spp prevalence among the different body condition scores (Table-7).

DISCUSSION

In present study, the overall GI helminthes infection of cattle was about 54.2% which is very comparable with the prevalence reports of Derib [24] in Bahir-Dar (50%); Dejene [25] in Western Hararghe (50.8%) and Fikru *et al*. [26] in Western Oromiya (52.4 %). However, our result is less than the report of Estehewot [27] in dairy cows in and around Holeta (82.8%); Hailu *et al.* [28] in small dairy farms of Jimma town (77.6%); Manaye [29] in Asella and its surrounding high lands (71%) and Moti *et al*. [30] in Bedelle district (64.2%). The differences could be due to variations in deworming practices, management conditions and climate difference among the study areas [3, 31].

The finding of this study also showed there was a significant difference in prevalence of GI helminthec infection between the study sites ($P<0.05$). The highest infection prevalence rate was observed in Iluaga peasant association (80.6%) (Table-1). This variation may be due to over stocking and frequent exposure to the fixed communal grazing lands that have been contaminated in the case of Iluaga peasant association. This result agrees with the report of Kemal and Terefe [13] while contradicts with the report of Diriba and Birhanu [32]. The difference may be due to the variation in agro-ecological condition, geographical location, number of study samples, management system of cattle and climatic conditions of the study areas [23].

Among the GI helminthes observed, nematode (39. 4%) was the most prevalent parasite followed by trematodes (22.0%). The only cestode (5.2 %) detected in this study area was *Moniezia.* This result agrees with the findings of Telila *et al.* [33] in eastern Shoa zone and Tshering *et al*. [34] in Bhutan. Gastrointestinal nematodes observed were *Ascaris* (10.1%), *Trichostrongyles* (9.1%), *Toxocara* (7.3%), *Trichuris* (6.6%) and *Nematodirus* (6.3%) whereas *Fasciola* (17.0%) and *Paramphistomum* (11.9%) were the main trematodes observed in our result (Table-2). This high level of multiple infections may be due to factors like poor management methods [10] and suitability of the area for the survival of parasites [13] and low attention given to the sub clinical forms and suitability of the climate for survival and proliferation of the parasites in the study areas [35].

Our result also shows that females (58.4%) were more infected by GI helminthes than males (41.6%) (Table-3). Nevertheless, the result indicated that sex-wise prevalence helminthes infection was not found to be statistically significant ($p>0.05$). This is most probably due to an equal opportunity for infection when they are exposed to the parasites in the communal grazing pasture. This result resemble with that of the previous reports [13, 30, 36].

The present also study revealed a significant variation of GI parasitic infection between different age groups of cattle in which adult animals were highly infected than calf and young cattle (Table-3). This might

be due to their accessible to contaminated pasture by the adult and restriction of young to free grazing by the owner. This finding is very similar with that of Addisu *et al*. [37] in West Arsi zone; Fatima*et al.* [39] and Tshering *et al.* [34] in Pakstan. On the other hand, the reports of Kemal and Terefe [13] in Gedebano Gutazer; Nigatu [36,] in Awi and [37,38] Nganga *et al.* [39] in Kenya disagrees with this report. The researchers justified the result that it could be because of the adult animals may acquire immunity to the parasite through frequent challenge and expel the ingested parasites before they establish infection. Thus, young animals are more susceptible due to immunological immaturity and immunological unresponsiveness [40].

The present study also indicated the higher prevalence rate of GI parasites in local breed (71.5%) than cross breed (28.5%) (Table-3). However, the breed of the animals did not show significant differences with the prevalence of parasites. This report disagrees with the finding of Etsehiwot [27], who reported about 66.33% of parasitic infection in exotic and 18.43% in cross breed cattle. The difference may be attributed due to the small number of cross breed animals used in the present study. Body condition was also an important variable considered to see the difference in prevalence of GI helminthes infection in cattle recruited for this study. The study further revealed that body condition of the animal showed significant association with the prevalence of the parasites. Poor body condition (46.7%) animals have higher prevalence than medium (29.9%) and good (23.4%) body condition (Table-3). Body condition score infection was statistically significant ($P < 0.05$). This is because of the well-fed animals develop a good immunity that suppresses the fecundity of the parasites [40]. This finding agrees with the previous reports [32, 33].

A higher proportion of *Fasciol*a and *Paramphistomum* were obtained in adults than young ones in this study (Table-4). This may probably be due to the opportunity of exposure to the intermediate hosts [41]. It may also be due to the management system, whereby calves grazed around farms, whereas adults' trekked long distances to valleys, flood plains or swampy areas during the dry season, so exposing adults to contaminated pastures [10]. This higher proportion of flukes in adults than young animals confirms the earlier observations of other researchers [13, 42, 43]. Moreover, *Fasciola* predominates any of the trematodes species and is supporting to the claim made by Moti *et al*. [30] in Bedelle district. The incidence of *Fasciola* is determined by the presence of snail [34, 44].

CONCLUSION

This study revealed that the GI helminthes parasites occurring in selected sites of Ejere district were *Fasciol*a, *Paramphistomum, Ascaris, Trichostrongyle* spps., *Toxocara* spps., *Trichuris* spps., *Nematodirus* spps. and *Monezia* spps. From this study in general, body condition score, age and poor management system are the most important risk factors influencing the occurrence of GI helminth parasites in the study area. Thus, appropriate treatment for these livestock, using integrated fluke control measures and teaching the society on how to improve their livestock management is very essential in this study area.

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