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Prevalence of gastrointestinal parasitism of cattle in East Showa Zone, Oromia Regional State, Central Ethiopia

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This study was conducted from November 2011 to April 2012 in the East Showa Zone, Oromia Regional State, Central Ethiopia in four selected study area to investigate the prevalence, burden of helminths, and to asses associated risk factors. A total of 326 fecal samples were used for qualitative and quantitative coprological examination. The overall prevalence was 61% of gastrointestinal (GI) helminths and the prevalent helminthes eggs identified were *Strongyle* type egg (41%), *Fasciola* (36.5%), *Paraphostomum* (18.4%), *Toxocara* (7.7%), *Trichuris* (5.2%), and *Monezia* (2.8%). This result indicated the highest prevalence of *Strongyle* type eggs than other helminths egg and the lowest prevalence of *Monezia* egg. Out of 61% of infected animals 9.5% of prevalence was recorded in an animal having history of anthelmintic treatment while the rest 51.5% was recorded in the animal having no history of anthelmintic treatment. The 30.9% of animals were found to be infected with more than one helminths parasite. There was higher mean eggs per gram (EPG) in animals >7 years of age group, followed by animals <2 and 2 to 6 years age group. But no significant difference was observed among age groups except *Trichuris* (P = 0.006) that is high in animals <2 years of age and lower in animals 2 to 6 years of age. The occurrence of many GI helminths was found relatively higher in males than females. But there was no significant difference observed between sexes with exception of *Trichuris* that was higher in males. The mean burden of *Strongyle* and total EPG was found significant (P=0.00) among animals of different body condition. Finally, conclusions were drawn and recommendations were forwarded.

Key words: Age, anthelmintic, body condition, bovine GI helminths, East Showa, prevalence, sex.

INTRODUCTION

The growing demand for the meat and milk in developing world, changing function of livestock and changing consumers perspectives are the major driving forces in the global livestock sector during the next two decades (World Bank, 2001). Remarkable increase in human population and the movement of people from rural areas to urban centers will increase the demand for food of animal origin. By the year 2020 the global population is projected to consume about 120 million tons of meat and 220 million tons of milk above the current consumption (World Bank, 2001; Ibrahim and Olaloku, 2000).

Ethiopia is an agricultural country with over 85% of its population engaged in agricultural activity. It has diverse agro-ecological zones which contributes to the evolution of different agricultural production systems. Animal production forms an integral part of agricultural system in almost all ecological zones of the country (Tegegne and Crawford, 2003). The animal production systems is

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extensive, semi-intensive and intensive in Ethiopia and have 53 million heads of cattle (CSA, 2012). They serve as source of food, hides and important draught power for crop production. However, the productivity of these animals is severely reduced by malnutrition, low management system, low genetic potential and health problems. Among the livestock health problem, diseases caused by helminths parasite is highly prevalent and economically important in many parts of the world (Gracey, 1986).

Gastrointestinal parasite infection is one of the major causes of wastage and decreased productivity exerting their effect through mortality, morbidity, decreased growth rate, weight loss in young growing calves and late maturity of slaughter stock, reduced milk and meat production and working capacity of the animal mainly in developing countries (Newman, 1995). These effects largely relates to specific damage caused by the parasites including villous atrophy at the site of gastrointestinal nematode attachment and liver trauma resulting from the presence of migratory liver fluke (Murray and Rushton, 1997). Indirect effects have also been described, including altered feed intake, digest flow rate, nutrient absorption and liver metabolic activity, endocrine status and immunological response (Hansen and Perry, 1994).

A number of helminths species are known to infect cattle worldwide. The most important ones include nematodes like *Strongyle* species (*Haemonchus, Ostartagia, Trichostrongylus, Cooperia*) and trematodes of economic importance *Fasciola* species (*Fasciola hepatica* and *Fasciola gigantica*) and *Paraphistomum* species (*Paraphistomum cervei*), while cestodes like *Monezia* species (*Monezia benideni* and *Monezia expanza*) could also be important constraints in animal production (Onah and Nawa, 2000).

There are many associated risk factors influencing the prevalence and severity of GI helminths. These include age, sex, weather condition and husbandry or management practices (Khan et al., 2009). Gastrointestinal infection is one of the most prevalent diseases of ruminants in Ethiopia. A study conducted in and around Holleta indicated that the overall prevalence parasitic infections of cattle were 82.8%. The predominant helminths egg identified were trematodes (*Fasciola* and *Paraphistomum* spp.) 80.6%, *Strongyles* 66.25%, mixed infection (trematodes and *Strongyles*) 63.12%, while others such as *Trichuris* and *Monezia* 1.5% (Etsehiwot, 2005). Other study conducted on gastrointestinal (GI) parasite of ruminants in Western Oromia also showed that the overall prevalence of GIT parasites was 69.6% in cattle with predominant prevalence of *Strangles* and *Eimeria* parasite (Regassa et al., 2006). The present study is therefore initiated with the following specific objectives: to investigate the different types of GI helminths affecting cattle; to investigate the prevalence and worm burden of helminths population in cattle; to asses some risk factors associated with prevalence of cattle GI helminths.

MATERIALS AND METHODS

Study area

The study was conducted from November 2011 to April 2012 in East Showa Zone which is one of the 18 zones of the Oromia region. From this zone four study areas were selected, namely, Bishoftu and Ude from Ada'a, Dukem from Akaki and Chefe Donsa from Gimbichu district. Bishoftu was the center where this study was carried out. Bishoftu is located at 9°N latitude and 40°E longitudes at an altitude of 1850 m above sea level and situated in central highlands of Ethiopia. Bishoftu has an annual rain fall of 866 mm of which 84% falls in the long rainy season extending from June to September. The rain fall is bimodal. The mean annual maximum and minimum temperature ranges are 26 and 14°C, respectively (CSA, 2012).

Study animals

The study animals were cattle found in Bishoftu, Chefe Donsa, Dukem, and Ude. Cattle in the study areas were purposively selected for helminths egg examination. A total of 326 heads of cattle were examined during the study period.

Study design

Fecal sample collection

Fecal samples were directly collected per rectum with new, unused gloves for each animal. Each sample was put in plastic containers with lids and labeled with animal identification record including the age (based on their teeth eruption and by asking the owner), sex, body condition (thin, moderate and good) based on literature location, and date of anthelminthic treatment were recorded with indelible pen and 10 ml of 3% formalin was added into sample container. Then, the samples were kept in refrigerator at 4°C for later examinations.

Coprological examination

The collected faecal sample were processed and examined using qualitative techniques (floatation and sedimentation) as described by Urquhart et al. (1996) and quantitative parasitological techniques by using McMaster egg counting methods according to the standard procedures given by Soulsby (1982) and MAFF (1997). Those fecal samples that were positive for *Strongyles*, *Trichuris*, *Toxocara*, and *Monezia* were subjected to egg output (eggs per gram, EPG) of feces count using McMaster egg counting technique (Hansen and Perry, 1994) and the degree of infestation was categorized based on literature (Aiello and Mays, 1998). Sodium chloride was used as flotation fluid for this study by preparing in the laboratory.

Data analysis

Data was first entered into Ms Excel program (Microsoft Corporation, USA) and screened for errors that might have occurred during the entry. Any error detected was corrected by rechecking against the original data forms. The data was analyzed using SPSS 15 version and Pearson chi-square (χ^2) data analysis method was used to determine the association of prevalence of each GIT helminths with location, anthelminthic treatment, and body condition and host factors like sex and age of the animal. Result $P<0.05$ was considered as significant differences (Clark, 1992).

Table 1. Anthelmintic treatment history and prevalence of parasite.

Parameter	No. tested	Not treated (%)	Treated (%)	Total (%)	χ^2, p-value
Negative	266	98 (30)	29 (8.9)	127 (38.9)	4.19, 0.04
Positive	60	168 (51.5)	31 (9.5)	199 (61.1)	
Total	326	266 (81.5)	60 (18.4)	326 (100)	-

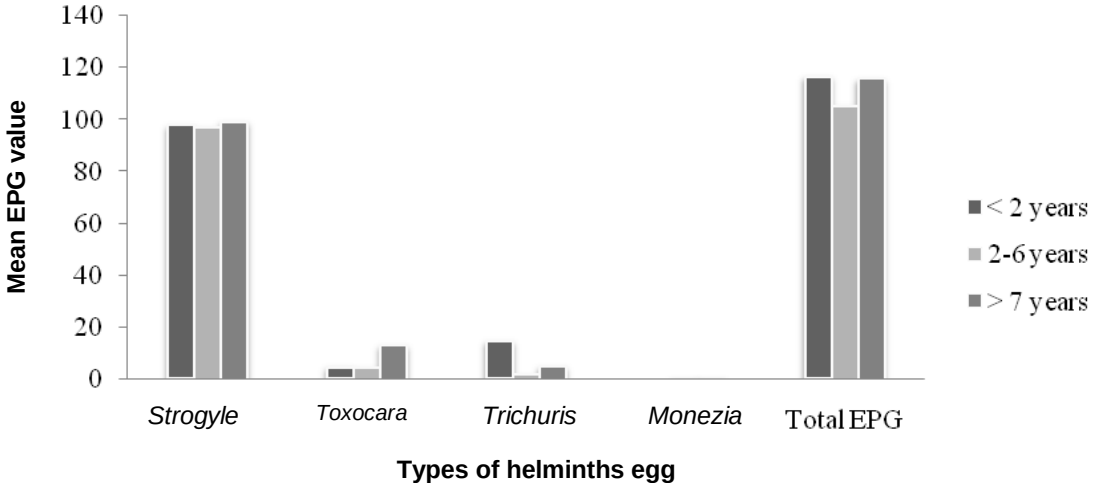

Figure 1. Comparison of mean EPG in animals of different age groups.

RESULTS

Coprologocal examination

From the total of 326 fecal samples examined by sedimentation, floatation and McMaster methods, the overall prevalence of GI helminths were found to be 61%.

Anthelmintic treatment history and prevalence of parasite

From the overall prevalence 61%, 9.5% of prevalence was recorded in an animal which had history of anthelmintic treatment, while the rest 51.5% was recorded in the animal with no history of anthelminthic treatment. The prevalence of parasite in animals having history of anthelmintic treatment was lesser than the animals with no history of anthelmintic treatment (Table 1). The quantitative examination shows that majority of animals positive for helminths 183 (56.1%) were infected at lower degree (<500 EPG), while few 16 (4.9%) animals were moderately (500 to 1000 EPG) infected, and there were no animals infected heavily (>1000 EPG). The egg of helminths identified with respective genera was *Strongyle* (41%), *Fasciola* (36.5%), *Paraphostomum* (18.4%), *Toxocara* (7.7%), *Trichuris* (5.2%), and *Monezia* (2.8%).

Prevalence and mean EPG of helminthes in animal of different age groups

The result revealed that the prevalence and mean burden of helminths parasite was higher in animals >7 years age group followed by animals <2 and 2 to 6 years age group, respectively; but with no significant difference (P>0.05) observed except *Trichuris* which was significant (P=0.02) between age groups that is high in animals <2 years of age and lower in animals of 2 to 6 years (Figure 1 and Table 2). The mean number of helminthic egg excreted by the cattle in the three age groups significantly varied for *Trichuris* (P= 0.006) as it was comparatively higher in age groups of <2 years. The significance was marginal for *Toxocara* (P=0.06) as shown in Table 3.

The prevalence of different GI helminthes in different study area

The prevalence or distribution different parasites genera were also different from one study area to another. The prevalence of most parasite genera were higher in Chefe Donsa than the prevalence recorded in Bishoftu, Dukem and Ude, except *Toxocara* that was found higher in Dukem and Ude (Table 4). The difference can be due to management or grazing system, regular deworming practice and sample size difference collected from each area.

Table 2. Prevalence of different GI parasite in animal of different age groups (n= 326) .

Helminths	Prevalence	<2 Years	2-6 Years	>7 Years	Total	χ^2, p-value
Fasciola	% within age group	28.9	31.0	34.5	36.5	2.59, 0.27
	% of total	4.0	12.5	15.0	36.5	
Paramphistomum	% within age group	26.7	17.3	16.9	18.4	2.38, 0.30
	% of total	3.7	7.4	7.4	18.4	
Strongyle	% within age group	53.3	38.1	40.8	41.4	3.27, 0.19
	% of total	7.4	16.3	17.8	41.4	
Toxocara	% within age group	6.7	6.5	9.2	7.7	0.79, 0.67
	% of total	0.9	2.8	4.0	7.7	
Trichuris	% within age group	13.3	2.9	4.9	5.2	7.56, 0.02
	% of total	2.1	1.2	1.8	5.2	
Monezia	% within age group	2.2	4.3	1.4	2.8	2.27, 0.32
	% of total	0.3	1.8	0.6	2.8	
Total		45	139	142	326	

The mean number of helminthic egg excreted by the cattle in the three age groups significantly varied for *Trichuris* (P= 0.006) as it was comparatively higher in age groups of <2 years. The significance was marginal for *Toxocara* (P=0.06).

Table 3. Mean burden of different GI helminths in different age groups.

Age group	No. tested		*Strogyle* EPG	*Toxocara* EPG	*Trichuris* EPG	*Monezia* EPG	Total EPG
<2 years	45	Mean	97.8	4.4	14.4	0	116.6
		Standard deviation	126.6	17.9	42.1	0	151.1
2-6 years	139	Mean	96.8	4.3	1.7	0.2	105
		Standard deviation	156.1	18.5	11.1	13.3	164.3
>7 years	142	Mean	99.3	13	4.9	0.3	115.8
		Standard deviation	157.7	45.6	23.3	4.2	183.9
Total	326	Mean	98.1	8.1	4.9	1.1	111.3
		Standard deviation	152.7	33.3	23.3	9.1	171.1
-		F-test	0.009	2.74	5.11	1.74	0.16
-		p-value	0.99	0.06	0.006	0.17	0.84

The prevalence and mean EPG of the GI helminths by sex

The prevalence of the GI helminths based on animal's sex was identified. Out of 137 female animal examined, the following were the infected *Fasciola* (38%), *Paraphistomum* (16%), *Strongyle* (44.5%), *Toxocara* (6.6%), *Trichuris* (2.0%), and *Monezia* (2.9%); whereas 189 male animals examined were infected with *Fasciola* (53%), *Paraphistomum* (20%), *Strongle* (39%), *Toxocara* (8.5%), *Trichuris* (6.9%) and *Monezia* (2.6%) parasite. There was relatively higher occurrence of all GI helminths in male animals than female animals. But sex had no significant effect on the prevalence of helminths parasite (Table 5). The mean burden of different helminths parasite was also assessed between sex of animal and revealed higher mean burden in male animals than female animals (Figure 2). The mean burden of *Trichuris*

Table 4. The prevalence of different GI helminths within different study area

Study area	No. tested	Name of the helminthes genera					
		***Fasciola* (%)**	***Paraphist* (%)**	***Strongyle* (%)**	***Toxocara* (%)**	***Trichuris* (%)**	***Monezia* (%)**
Chefe Donsa	98	54 (55.1)	39 (39.8)	51 (52.1)	6 (6.1)	14 (14)	6 (6.1)
Bishoftu	53	11 (20.7)	3 (5.7)	15 (28.3)	2 (3.8)	2 (3.8)	1 (1.9)
Dukem	69	25 (36.2)	14 (20.3)	34 (49.3)	8 (11.6)	0 (.0)	1 (1.4)
Ude	106	29 (24.4)	4 (3.8)	35 (25.9)	9 (8.5)	1 (.9)	1 (.9)
Total	326	119 (36.5)	60 (18.4)	191 (41)	25 (7.7)	17 (5.2)	9 (2.8)

Table 5. Prevalence of the helminths parasite between sexes of animals (n=326).

Helminths	prevalence	Female	Male	Total	X^2, p-value
Fasciola	% within sex	38	35	36.5	0.215, 0.643
	% of total	16	20	36.5	
Paramphistomum	% within sex	16	20	18.4	0.866, 0.352
	% of total	6.7	11.6	18.4	
Strongyle	% within sex	44.5	39	41.4	0.945, 0.331
	% of total	18.7	22.7	41.4	
Toxocara	% within sex	6.6	8.5	7.7	0.403, 0.525
	% of total	2.8	4.9	7.7	
Trichuris	% within sex	2.9	6.9	5.2	2.518, 0.113
	% of total	1.2	4.0	5.2	
Monezia	% within sex	2.9	2.6	2.8	0.022, 0.881
	% of total	1.3	1.5	2.8	
Total		137	189	326	-

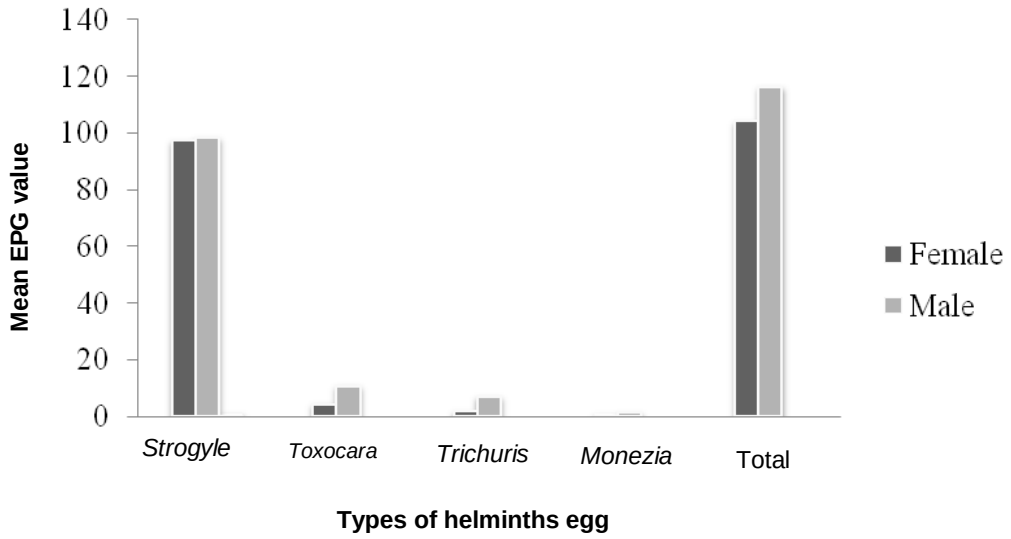

Figure 2. The comparison of mean EPG burden of helminths between sexes of animal.

Table 6. The mean burden of helminths parasite between sexes of animal.

Sex	No. tested		*Strogyle* EPG	*Toxocara* EPG	*Trichuris* EPG	*Monezia* EPG	Total EPG
Female	137	Mean	97.4	4.4	1.8	0.7	104.3
		Standard deviation	139.1	18.6	11.2	6	147
Male	189	Mean	98.4	10.8	7.1	1.3	116.4
		Standard deviation	162.2	40.6	28.9	10.8	186.7
Total	326	Mean	98	8.1	4.9	1.1	111.3
		Standard deviation	152.7	33.3	23.3	9.1	171
-	-	F-test	0	3.01	4.16	0.33	0.38
-	-	p-value	0.95	0.08	0.04	0.56	0.53

showed significant difference (P=04) between sex which is 7.1 in males and 1.8 in females (Table 6).

Animals that were found positive for helminths parasites harbored one or more parasite. The animals were found with multiple parasite infection, where 101 (31%) out of the total animals were examined. Mixed infection investigated within age group was 44.4, 20.9 and 31% in cattle <2, 2 to 6 and >7 years, respectively. The *Fasciola* and *Strongyle* combination prevalence was found higher (9.2%) by preceding the combination occurrence of *Fasciola, Paraphistomum*, and *Strongle* (5.5%) than other helminths combination prevalence in different age groups (Table 7).

During the study period, the fecal sample was collected with the history of animal body condition. Fecal examination revealed that each animal within thin, moderate, and good body condition were found to discharge an average of 163.4, 115.2, and 76.6 EPG, respectively. There was significant difference among body condition on mean EPG of *Strongyle* and total EPG (P=0.0) which was higher in thin animals and lower in animals with good body condition (Table 8 and Figure 3).

DISCUSION

The preset study showed the overall prevalence of GI helminths to be 61%. This result is very close to the report on gastrointestinal helminths prevalence in zebu cattles by Teka (2008) and relatively higher than the report on dairy cow by Derib (2005) in Bahir-Dar and its surrounding which is 59.5 and 50%, respectively. The higher prevalence was also reported by Etshiwot (2004) to be 82.8% in Holleta and its surroundings and by Zerfu (1991) to be 81% in Assela and its surroundings. The prevalence difference in different study area could have resulted from difference in management system, topography, deworming practices, and climatic condition that favors the survival of infective stage of the parasite and intermediate hosts.

According to the current study result which indicated the prevalent helminths egg with respect to their genera were *Strongyle* (41%), *Fasciola* (36.5%), *Paraphostomum* (18.4%), *Toxocara* (7.7%), *Trichuris* (5.2%), and *Monezia* (2.8%). In this result, the *Strongle* species were highly prevalent than other parasite genera. But in previous reported studies (Derib, 2005; Etsehiwot, 2004; Zerfu, 1991), trematodes were found to be the dominantly prevalent than *Strongyle* species. The prevalence of *Paraphistomum* (60%) reported by Manaye (2002) was quite higher than the current finding. The *Monezia* prevalence (2.8%) reported by Etsehiwot (2004) was found similar with the current study prevalence. The prevalence difference among the genera of helminths in different study area indicates that the topography and climatic condition of each study area vary from one another in supporting infectivity of different parasite and development of their intermediate hosts.

The coprological examination of collected fecal sample revealed the mean prevalence of different helminthes genera in animals of different age groups and indicated the higher prevalence of *Trichuris* in animals <2 years. This finding is in harmony with reports of Manaye (2002) on bovine GIT helminthes in Assela and its surrounding highlands. Watson and Gill (1991) reflected common ground which young animals are believed to be more susceptible to parasitic and non parasitic infections. On the contrary, the result shows that *Strongyle* species are prevalent almost similarly in animals of all age groups which disagree with the aforementioned general belief. Previous report by Teka (2008) showed that there was no prevalence difference between ages.

There was higher occurrence of all GI helminths in male animals than female animals. But sex had no statistical significant effect on the prevalence of helminths parasite. The mean burden of different helminths parasite was also assessed between sex of animal and revealed higher mean burden in male animals than female

Table 7. Prevalence of mixed infection within age group.

Name of mixed helminthes	<2 years (%)	2-6 years (%)	>7 years (%)	Total (%)
Positive	20 (44.4)	27 (20.9)	44 (31)	101 (31)
F and P	2 (4.4)	2 (1.4)	3 (2.1)	7 (2.1)
F and S	2 (4.4)	13 (9.4)	15 (10.6)	30 (9.2)
F, P and TV	0 (.0)	1 (0.7)	0 (0.0)	1 (0.3)
F, P and S	4 (8.9)	6 (4.3)	8 (5.6)	18 (5.5)
F, S and T	1 (2.2)	1 (0.7)	1 (0.7)	3 (0.9)
F, P, S and TV	0 (.0)	3 (2.2)	1 (0.7)	4 (1.2)
F, P, S and T	1 (2.2)	3 (2.2)	2 (1.4)	6 (1.8)
F, S and M	0 (.0)	1 (0.7)	0 (0.0)	1 (0.3)
F, S and TV	1 (2.2)	1 (0.7)	3 (2.1)	5 (1.5)
P and S	4 (8.9)	1 (0.7)	4 (2.8)	9 (2.8)
P, S and T	1 (2.2)	0 (0.0)	0 (0.0)	1 (0.3)
P, S and M	0 (.0)	1 (0.7)	0 (0.0)	1 (0.3)
P and T	0.0	0 (0.0)	1 (0.7)	1 (0.3)
S and TV	1 (2.2)	1 (0.7)	4 (2.8)	6 (1.8)
S and T	3 (6.7)	0 (0.0)	1 (0.7)	4 (1.2)
S and M	0 (.0)	1 (0.7)	0 (0.0)	1 (0.3)
TOTAL	45	129	142	326

F= *Fasciola*, P= *Paraphitomum*, S= *Strongyle*, TV= *Toxocara vitulorum*, T=*Trichuris*, M= *Monezia*

Table 8. The mean EPG of different GI helminths in animals of different body condition.

Body condition	No. tested		*Strogyle* EPG	*Toxocara* EPG	*Trichuris* EPG	*Monezia* EPG	Total EPG
Good	107	Mean	63.1	7	6.5	0.9	76.6
		Standard deviation	128.5	31.1	23.8	9.7	145.5
Medium	174	Mean	102.6	9	2.6	1.1	115.2
		Standard deviation	148.6	35.1	16.4	9.2	163.4
Thin	45	Mean	163.3	7.8	10	1.1	178
		Standard deviation	195.2	32	39.3	7.5	229
Total	326	Mean	98	8.1	5	1.1	111.3
		Standard deviation	152.7	33.3	23.4	9.1	171
-	-	F-test	7.3	0.1	2.2	0.01	5.9
-	-	p-value	0	0.9	0.1	0.9	0

animals. The mean burden of *Trichuris* showed significant difference between sexes of animals which was 7.1 in males and 1.8 in females. Insignificant difference between sexes is similar with previous studies reported (Teka, 2008; Manaye, 2002) except significant difference between sexes on the prevalence of *Trichuris* in the current findings.

Fecal examination revealed that each animal within thin, moderate, and good body condition were found to discharge helminthes egg with an average of 163.4, 115.2, and 76.6 of EPG, respectively. There was significant difference among body condition on mean EPG count of *Strongyle, Trichuris* and total EPG which was higher in thin animals and lower in animals with good body condition. This finding contradicts the findings of Manaye (2002) who reported absence of significant difference on the prevalence of helminths in animals of different body condition. This might be that the animal in previous study done by Manaye (2002) could be in the good plane of nutrition that enables them to support

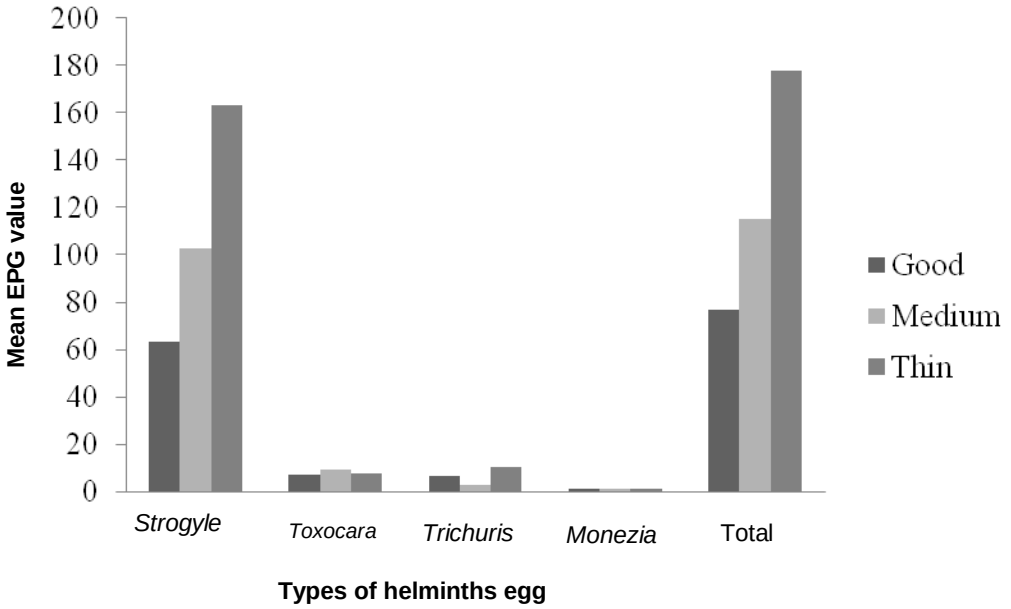

Figure 3. Comparison of mean EPG in animals with different body condition.

parasite infection without showing clinical helminthiosis. But animals of current study were possibly feed on crop residue like wheat and teff straw that is less nutritious, and infected animals can easily show clinical helminthiosis.

The aforementioned result showed that no animals were infected at higher intensity of parasite egg. This might be due to the fact that species of helminths prevalent in the area could be less reproductive (not prolific egg layers) or parasite at immature stage is higher than mature one. On the other hand, even if the higher burden of the parasite egg was not recorded; some infected animals were found with thin body condition that is direct in relation with the number of parasite egg. The change in body condition could be the possible indicator that the animals were infected both, with mature and immature stages or with less reproductive blood sucking parasite that can cause considerable damage to the host.

CONCLUSION AND RECOMMENDATIONS

Gastro-intestinal helminthes are important cattle health problems in the study area. Geographical location of the study area, body condition, age, sex, and anthelmintic therapy status considered as a risk factors for helminths infection had a varying degree of contribution for helminths infection. The mean egg per gram also varied due to the aforementioned risk factors among different animals.

Based on the aforementioned conclusion, the following recommendations are indicated: significance of these parasites should not be underestimated as they reduce the growth, productivity, reproductive potential of animals; strategic treatment and awareness creation should be adopted as former livelihood relies on rearing cattle; this study did not consider the breeds of animals, management and feeding systems, seasonal helminths dynamics, and identification of parasite to species level. Therefore, future detailed works should be undertaken.

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