ORIGINAL ARTICLE

Gastrointestinal helminth infections in small-scale dairy cattle farms of Jimma town, Ethiopia

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(Received in revised form: April 21, 2011)

ABSTRACT

A crossectional survey was carried out from November 2008 to April 2009 to determine and describe the prevalence and intensity of gastrointestinal parasite infections in small holder dairy cattle farms of Jimma town, Ethiopia. A total of 210 faecal samples were examined by modified Mc-Master slide and 163 (77.6%) of them were found to contain at least one gasterointestinal helminth parasite egg. The most prevalent gastrointestinal helminth parasite eggs detected were *Paramphistomum* (48.6%), *Strongylidae* (32.4%), *Fasciola* (23.3%), *Moniezia* (5.2%), *Strongyloid* (3.3%), *Toxocara vitulorum* (2.4%), *Trichuris* (1.9%), *Capillaria* (1.4%) and *Nematodirus* (0.9%) in decreasing order. The overall infection rates for nematode, cestode, trematode and mixed infections were 42.3%, 5.2 %, 71.9% and 19.7, respectively. The overall prevalence of gasterointestinal helminth infection was high in October (81.3%) and low in February (52.4%). A significant variation was observed in the prevalence of *Toxocara vitulorum* between young (7.01%) and adult animals (0.6%). The mean egg count was generally moderate (319.4 ± 62.3 per g of faeces). Intensity of strongyle infection in terms of epg showed no variations when different ages, body conditions, breeds and lactation conditions are compared. However, a higher epg count was observed between female and male animals. The genera of strongyles identified were *Haemonchus, Trichostrongylus, Strongyloides, Oesophagostomum*, *Bunostomum* and *Cooperia*. In conclusion, gasterointestinal helminth parasites are problems in small holder dairy farms in Jimma town. Future studies are required to evaluate the economic impact of helminth parasites and to formulate appropriate deworming practices that can be applied in order to alleviate the problem of worm burden in the study area.

Keywords: Gasterointestinal helminths, Jimma, Small scale dairy farm

INTRODUCTION

Helminth infection, especially subclinical gastrointestinal nematode infections are among the major health problems limiting the productivity in dairy animals (Dimaner *et al*., 2000; Johannes *et al*., 2009). Economic losses are caused by gastrointestinal parasites in a variety of ways. The losses can be through lowered fertility, reduced work capacity, involuntary culling, a reduction in food intake and reduced weight gain, lower milk production, treatment costs and mortality in heavily parasitized animals (Mcleod, 1995). In addition, the diverse agro-climatic conditions, animal husbandry practice and

pasture management largely determine the incidence and severity of various parasitic diseases in certain area. Furthermore, the prevalence of gastrointestinal parasites, the genera of helminth parasites involved, species and the severity of infection also vary considerably depending on local environmental conditions such as humidity, temperature, rainfall, vegetation and management practices (Barger, 1999; Kassai, 1999). The prevalence of helminth parasites in dairy cows in many African countries including Ethiopia is found to be high. For instance, Etsehiwot (2004) reported 82.2% in central Ethiopia whereas Keyyu *et al*. (2006) recorded prevalence of 44.4% and 37% for large and small scale dairy cattle, respectively in Tanzania. Furthermore, Charlotte and Madsen (1998), Chatikobo, *et al*. (2009) and Maingi and Njoroge (2010) reported that gastrointestinal parasites are among the constraints in dairy farms of Zimbabwe, Eastern Rwanda and Kenya, respectively.

Some of the major nematodes responsible for gastrointestinal tract parasitosis in ruminants under tropical environment are: *Haemonchus, Trichostrongylus, Nematodirus and Cooperia spp. (*Family*:* Trichostrongylidae*); Bunostomum trigonocephalum* and *Gaigeria pachyscelis (*Ancylostomatidae*); Chabertia ovina* and *Oesophagostomum spp. (*Strongylidae); *and Trichuris and Strongyloides spp*. (Troncy, 1989). In Jimma zone, limited studies have been undertaken to provide information on liver fluke infection (Bahiru and Epheriam, 1979; Tadele and Worku, 2007). But little or no attempt has been made to study gastrointestinal helminth infections specifically in dairy farms of Jimma town. Thus, this study was carried out to determine the prevalence, and intensity of gastrointestinal helminth infections in small scale dairy farms of Jimma town, Ethiopia.

MATERIALS AND METHODS

Description of the study area

The study was carried out from November 2008 to April 2009 in small holder dairy cattle farms of Jimma town. Jimma is located in Oromia National Regional State Administration, about 355 km southwest of Addis Ababa at latitude of $7^0$13' to $8^0$56' N and longitude of $35^0$52' to $37^0$37' E, and at an altitude of 1750 m above sea level. The area receives a mean annual rainfall ranging from about 1420 to 1800 mm which comes from the long and short rainy seasons. In normal years, the rainy seasons extend from February to October. The annual mean temperature ranges from about 12.1^{o}C to 28^{o}C (JZARDO, 2001).

Study animals

The study was carried out on 210 dairy cattle (57 calves and 153 adults) of 20 small holder dairy farms of Jimma town. All the cattle found in each farms during the study period were subjects of the study.

Study design

This investigation involved descriptive crossectional studies conducted on cattle of volunteer dairy farm owners found in Jimma town. Animal in each farms were categorised into sex, two age groups, i.e calves/young (≤12 months) and adult (>12 months), breed (local and cross) and body conditions (poor and good), as described by Jodie (2009). Cows were categorised based on lactation status (lactating and non-lactating). For this study, a dairy farm was defined as any livestock establishment with a minimum of one cow/animal.

Sample collection and processing

The faecal samples were collected per rectum and put into faecal pots, labelled and kept cool prior to transportation to the laboratory where they were examined immediately or stored in refrigerator (4^{o}C) for a maximum of 6 hours before processing. The samples were processed by Standard Flotation and Sedimentation techniques to investigate the eggs of helminth parasites. For those faecal samples that were positive to *Strongyles,* Modified McMaster egg counting technique was used to identify the degree of infestation based on the previous work of MAFF (1986). Levels of the worm infection were extrapolated from severity index defined by RVC/FAO (2009), where cattle are said to have low, moderate and

severe nematode infections if their faecal egg counts are less than 100 to 250, >250 to 500 and more than 500, respectively.

Coproculture of composite faecal samples were made and the larvae were identified to genus level. The coproculture procedure applied in the study was started by preparing composite faecal samples and then the faecal samples were finely broken up by using stirring device after moistening it with water. Charcoal was added and mixed with faecal samples and samples were transferred to a jar and kept in an incubator having a temperature of 27^{o}C for 10 days. During these days water was added every 2 days to the culture. Finally the third stage larvae (L3) and/or when present, L2 larvae were collected by Baermann technique and were differentiated as per the key in MAFF (1986). The larvae were counted and subjected to morphological examination for identification of the genera. For this purpose few drops of iodine solution was added to the tube to immobilise and stain the larvae and each larvae was examined under microscope (2x100).

Statistical analysis

The data collected from the study area were coded and analyzed by using SPSS version 16. The prevalence was calculated by dividing the number of animals harbouring a given parasite by the total number of animals examined. Percentage to measure the prevalence of helminths and chi-square and t-test to measure association between prevalence of the helminths and the breeds, age, sex, lactation condition and body conditions of animals were employed. In all analyses, descriptive statistics and means ± S.D for nematode egg count were used to summarize management practices in the dairy farms. Confidence interval was held at 95% and $p<0.05$ was set for significance level.

RESULTS AND DISCUSSION

Farm gastrointestinal helminth infections

Out of 210 dairy cattle examined in small-holder farms during the study period, 163 (77.6%), were shedding helminth eggs in their faeces (Table 1). A similar study done in dairy cattle farms in Holeta by Etsehiwott (2004) reported closer but a little higher prevalence of 82.8% as compared to the present study. In contrast, however, the prevalence of helminth type egg recorded in this study is relatively higher than the 50.2% (Fikru *et al*., 2006), 41.2% (Ephereme, 2007) and 26.3% (Darsema, 2009), prevalences previously reported in western Oromia, Addis Ababa and western Amhara region, respectively. The present study showed that the most predominant helminth egg was the *Paramphistomum* (48.6%) followed by *Strongyles* (32.4%) and *Fasciola* (23.3%). This agrees with previous reports from other geographical regions of Ethiopia (Darsema, 2009) and other countries (Padungtod *et al*., 2001). Prevalence for Nematodes, trematodes and Cestodes are shown in Figure 1.

This study revealed a higher prevalence in fluke infection in older than young age groups (Fig. 1). This confirms earlier observations of other workers (Maingi *et al*., 1993; Mbae *et al*., 2004). In contrast, the age relationship for different nematodes was less clear except for *Toxocara vitulorum, trichiris and nematodirus.* The prevalence of mixed infection (19.6%) is higher than the result obtained by Shireal *et al*. (2008; 6%). No significant difference was observed ($p > 0.05$) in the prevalence of gastrointestinal parasites between calves and adult dairy cattle. The same observations were recorded in the prevalences between female/male, body conditions, sex, and breed and lactation status of the animals (Table 2).

Variations were observed ($X^2 = 7.22$; $p < 0.05$) in the prevalence of *Toxocara vitulorum* (ascariosis) between young (7.01%) and adult animals (0.6%). This overall prevalence of ascaris in calves found in this study is higher than the previous report from Northern Ethiopia (Darsema, 2009). The observed prevalence of *Fasciola* infection as reflected by egg appeared to be greater in adult as compared to calves ($X^2 = 5.3$; $p < 0.05$).

The prevalences of *Strongyles*, *Strognyloid*, *Capillaria*, *Paramphistoumum* and *Moniezia* showed no statistical

variations among the two age groups (Table 3). The prevalence of *Moniezia* showed lower value in calves (Table 3) as compared to adult dairy cattle in this study. The lower proportion of calves infected, could be due to the opportunity of exposure to the intermediate hosts, the free-living soil mites on pasture (Cox and Todd, 1962).

Table 1. The spectrum and overall prevalence of gastrointestinal helminth parasites obtained from small holder dairy farms of Jimma town

GI helminths parasites	No. of positive animals*	95% CI
Strongyels	68 (32.4)	26.00 - 38.76
Strongyloid	7 (3.3)	0.88 - 5.78
Trichuris	4 (1.9)	0.04 - 3.78
Ascaris	5 (2.4)	0.3 - 4.45
Capillaria	3 (1.4)	0.10 - 3.05
Nematodirus	2 (0.9)	0.372 - 2.27
Fasciola	49 (23.3)	17.56 - 29.10
Paramphistomum	102(48.6)	41.75 - 55.38
Moniezia	11 (5.2)	2.2 - 8.27

* Values in parenthesis indicate percentage prevalences

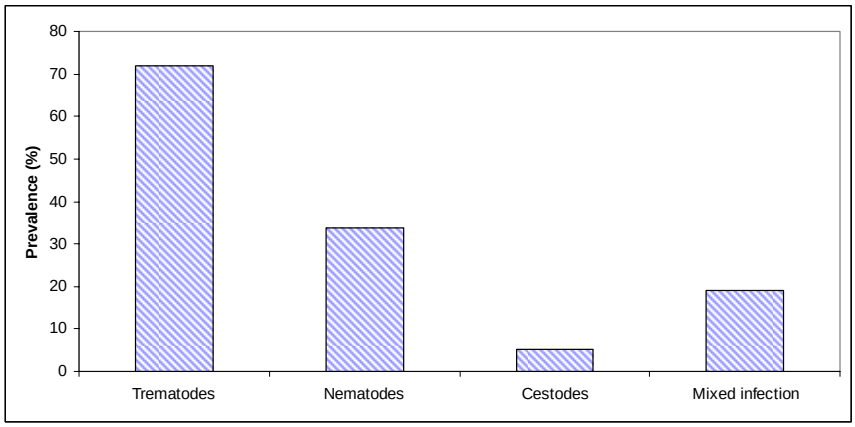

Figure 1. Prevalence of trematode, nematode, cestode and mixed infection in sampled animals (n = 210).

Table 2. Prevalence of gastrointestinal helminth infection in animals with different age, sex, body condition, breed groups and lactation conditions

Category		No. of animals examined	No. of positive animals*	95% CI	X^2	P value
Age	Calves	153	121 (79.1)	72.56-85.60	0.697	0.404
	Adult	57	42 (73.7)	61.89-85.47		
Sex	Male	23	19 (82.6)	65.84-99.36	0.370	0.543
	Female	187	144 (77)	70.91-83.09		
Body conditions	Poor	84	64 (76.2)	75.59-76.81	1.446	0.695
	Good	120	95 (79.2)	77.98-80.42		
Breed	Cross	186	143 (76.9)	70.76-82.99	0.509	0.475
	Local	24	20 (83.3)	67.25-99.40		
Lactation§ condition	LC	80	53 (66.3)	51.00-71.60	0.14	0.704
	NLC	28	20 (71.4)	62.90-79.90		

* Values in parenthesis indicate percentage prevalences
§LC: Lactating cows; NLC: Non lactating cows

Faecal egg count and intensity of infection

The mean egg count in strongyle positive animal (n = 68) was 319 ± 62.3. Out of the 68 animals, 77.9% (epg < 250) of them showed low intensity of infection and only 7.4% of them showed severe intensity of infection (epg > 500). The reason why the majority of the animals showed low infection can be associated with the presence of large number of adults from the sampled animals. Because age has an effect on responsiveness or to the development of immunity causing lower worm fecundity in adult animals (Kloossterman *et al*., 1991; Ploeger *et al*., 1994). The low infection intensity also indicates the low transmission and subclinical condition of helminth parasites of gastrointestinal tracts in dairy farms of Jimma town.

Strongyle infection in terms of epg was higher in female animals than male animals (Table 4). There was no significant variation in epg among different age group though a higher epg count was observed in calves. This observation is inconsent with the previous works in Ethiopia (Fikru *et al*., 2006) and Kenya (Machimmo *et al*., 2004) that sate no association between epg degree and age. However, Holland *et al*. (2000), Keyyu *et al*. (2005), and Jime´nez *et al*. (2007) reported statistically higher faecal egg count in adult dairy animals than young in Costa Rica, Tanzania and Vietnam, respectively. The current study further revealed that epg has no statistical association between lactation status and body conditions of the animals (Table 4).

Table 3. Prevalence of gastrointestinal helminth parasites among adults (n = 153) and calves (n = 57) examined

Types of parasites eggs	No. of positive adults*	No. of positive calves*	χ^2	P value
Strongyles	45 (3.4)	23(40.3)	2.2696	0.132
Strongyloid	3 (1.9)	4 (7)	3.2956	0.069
Trichuris	1(0.6)	3 (5.2)	4.7236	0.030
Ascaris	1(0.6)	4 (7)	7.2236	0.007
Capillaria	3 (1.9)	0 (-)	1.1338	0.287
Nematodirus	0 (-)	2 (3.5)	5.4200	0.020
Fasciola	42 (27.5)	7 (12.4)	5.3426	0.021
Paramphistomum	79 (51.6)	23 (40.3)	2.1156	0.146
Moniezia	10 (6.5)	1(1.7)	1.1926	0.167

* Values in parenthesis indicate percentage prevalences

Table 4. Mean egg count of strongyle egg type positive animals among different age, sex, body conditions, breed and lactation status

Category		No. of animals	Mean egg ± SD	95% CI	P , t- values
Age	Calves	26	447.2±152.2	125.9-768.5	0.86, -1.11
	Adult	42	264.3±60.1	142.8-385.6	
Sex	Female	57	328.9±65.3	198.1-459.9	0.01, 2.38
	Male	11	170±13.4	139.8-200.1	
Body conditions	Poor	35	380±93.2	190.6-569.4	0.125, 1.15
	Good	24	241.6±79.4	87.7-395.6	
Breed	Cross	60	313.5±69.4	173-3-453.9	-0.231, 0.59
	Local	8	356.3± 116.3	81.3-631.2	
Lactation* condition	LC	25	268±84.1	94.3-441.6	0.575, -11
	NLC	12	295.8±119.8	33-558.6	

*LC: Lactating cows; NLC: Non lactating cows

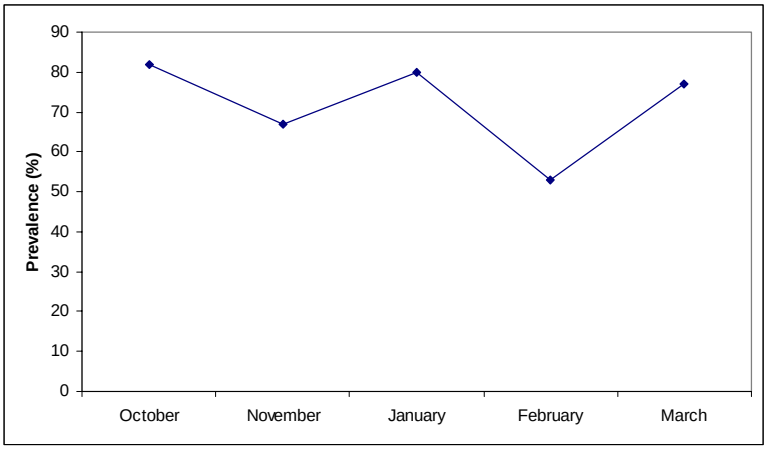

Figure 2. Monthly prevalence of gasterointestinal helminth infection.

Monthly prevalence

In this study the overall prevalence of gasterointestinal helminth infection was high in October (wet month) and low in February (Fig. 2). The reason for this could be due to the conduciveness of the environmental condition for the development of larvae.

Coproculture studies

In coproculture, 389 larvae were examined. Out of these, six genera of strongyles were identified: *Haemonchus, Trichostrongylus, Strongyloides, Oesophagostomum*, *Bunostomum* and *Cooperia*, in decreasing order.

The present study indicated the gastrointestinal helminths are constraints in the small scale dairy farms. Future studies are required to evaluate the economic impact of these helminth parasites in small scale dairy farms and to assess the deworming practices and formulate the deworming strategies applicable in the study area.

ACKNOWLEDGMENT

The authors wish to thank the dairy cattle owners in Jimma town. We gratefully acknowledge the help of Mr. Getachew, the head of Jimma Town Dairy Farm Owners Cooperative. We also thank the parasitology laboratory technicians of Jimma University, College of Agriculture and Veterinary Medicine for their assistance. The authors would like to express their heartfelt gratitude to the College of Agriculture and Veterinary Medicine of Jimma University for financial support.

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