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Occurrence of Gastro Intestinal Nematodes of Cattle in and Around Gondar Town, Amhara Regional State, Ethiopia

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Abstract: A cross sectional study was carried out from October 2010 to March 2011 to determine the prevalence and risk factors associated with gastrointestinal (GI) nematode parasitism in cattle in and around Gondar town, North Gondar, Amhara region, Northwest Ethiopia. A total of 388 fecal samples of cattle of different sexes and ages were collected and examined for GI nematode eggs using sedimentation and floatation techniques. Out of these, 107 (27.57%) animals were found positive for one or -mixed GI nematode infection. The result of fecal examination revealed eggs of *strongly*-type*, Ascaris* and *Trichuris* species. Cattle harboring one-parasite eggs were more common (71.02%) than those harboring two (28.79%) or three (0.9%).-. Three G1 nematode parasite egg-types were detected; Ascaris (57%), Strongles (56.07%) and Trichuis (16,82%).-. A significantly higher prevalence ($P<0.05$) of infection with GI nematodes was recorded in calf (41.30%) than in young (34.14%) and adult (23.07%) animals. Sex-wise prevalence of GI nematodes was not significant ($p>0.05$). There was a statistically significant variation ($P<0.05$) among the different body conditions study animals, where highest prevalence was recorded in poor (65.1%) followed by medium (26.3%) and good (13.6%) body condition animals. For both breeds of cattle, there was a significant difference in prevalence ($P<0.05$) of GI nematode infections with infection rate of 33.04% and 19.6% for local and cross breeds, respectively. The current study suggests that further studies on seasonal transmission pattern of these GI nematodes and other helminthes parasites are required in order to design rational, economic and locally sustainable control programs.

Key words: Cattle · Fecal · Gastrointestinal Nematode · Gondar · Prevalence · Sedimentation · Floatation

INTRODUCTION

In Ethiopia there are 49,297,898, cattle population of which 10,512,777 are found in Amhara region [1]. And in Gondar area there are about 2,407,544 cattle populations [2]. Even though Ethiopia has immense resources and a home for many genetic resources, the livestock of the country are characterized by low productivity levels even below the average of Africa, leading to low per capital consumption of animal products. This is mainly due to the presence of high and wide spread prevalence of animal diseases [3]. Helminthiasis is considerable significance in the wide range of agro-climatic zones in sub Saharan Africa and constitutes one of the most important constraints to cattle production [4].

Gastrointestinal (GI) parasite infections are a worldwide problems for both small large scale farmers, but their impact is greater in sub Saharan Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species [5]. They cause retarded growth lower productivity and high economic losses. Thus affect the income of small holder dairy farming communities [6].

The low productivity is due to a number of factors among which are quantitative and qualitative; deficiencies in the feed resource base, diseases, poor animal performance level and insufficient knowledge on the dynamics of the different types of farming systems existing in the country [7]. Prevalence of GI helminthes has been reported ranging from 0.7 to 84.1% in domestic animals from various parts of the world. There are many associated risk factors influencing the prevalence of GI helminthes including age, sex-and weather condition and husbandry or management practices [6].

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Despite the immense progress made to control parasitosis, farmers in Ethiopia continue to incur significant losses due to insufficient availability of information in the epidemiology of the parasites. Furthermore, parasites appear to be a major factor for lowered productivity of Ethiopian livestock sector [5]. To take the control measures assessment and epidemiological surveillance of nematode parasite by different diagnostic methods like fecal examination, EPG, determination and identification of specific species nematode is important [8, 9]. Emphasis must be placed on preventing the environment from becoming contaminated. This is achieved by production of safe pastures which intern achieved by a variety of means like silage and hay after mach, pasture resting, reseeding and burning of pasture and anthelmintic treatment [10].

Most of the studies conducted on the prevalence and distribution of GI nematodes in the country tended to be in the central and Northern highlands and semi-arid regions of Eastern Ethiopia and little is known about the prevalence and distribution of GI nematodes infecting cattle in and around Gondar town.

Therefore the objectives of the present study were to assess the prevalence of GI nematode parasite of cattle in Gondar town, to investigate the main risk factors associated with the prevalence of GI nematode infection in cattle, to forward some important recommendations for the control of parasitic infections in the study area and to forward a base line data for further studies.

MARERIAL AND METHODS

Study Area: A cross sectional study was conducted from October 2010 to March 2011 to determine the prevalence of GI nematode parasites of cattle in and around Gondar town, North Gondar zone, Amhara region, Northwest Ethiopia. It is found at 750 km northwest of Addis Ababa. It is located on 35°7' N and 13°8' E and lies at an altitude of 2200 meter above sea level. The area receives mean annual rain fall of 1172 mm mainly in rainy season with average temperature of 19.7°C. In and around Gondar town there are about 2,407,544 cattle populations [2].

Study Animals: The study animals were 388 cattle of two breeds (158 cross and 230 local breeds), both sexes (194 male and 194 female) and different age groups. Body condition scoring was made according to Morgan *et al.,* [11] and recorded as poor, medium or good. Due to the absence of written records, the age of the animal was estimated based on owners' response and also by looking to the dentition pattern of the animals [12]. Based on this, study animals were classified as calf (< 1 year), young (1 to 3 years) and adult (>3 years). The fecal samples were collected from Gondar University and BRIGE of HOPE dairy farms and also from animals presented to Gondar University veterinary clinic.

Study Design: A cross sectional study design was used to determine the prevalence of bovine GI nematode parasites during the study period and to investigate the main factors influencing the prevalence and intensity of infection in cattle.

Sampling and Sample Size Determination: Systematic randomsampling method was used to select study animals. The sample size was determined based on the expected prevalence of 50% and absolute desired precision of 5% at confidence level of 95% according to the methods provided by Thrusfield [13].

$$n = \frac{1.96^2 pex(1\text{-}pexp)}{d^2}$$

where

n = Require sampling size
p = Expected prevalence
d = Desired absolute precision

Therefore, based on the formula the total sample size calculated was 388.

Sample Collection and Examination: A total of 388 fecal samples were collected during the entire period of the study, directly from the rectum of selected animals using a gloved hand and placed in air and water tight sample vials. During sampling, data with regard to age, sex, breed; body condition and date and place of sample collection were recorded for each sampled animal. Samples were soon taken to the parasitology laboratory of Faculty of Veterinary Medicine, University of Gondar, as fresh as possible.

Coprological Examination: Faecal samples were collected in polyethylene plastic labeled bags and were examined during the same day of collection by the concentration floatation technique according to Kruse and Pritchard [14].

Fecal samples were qualitatively examined on the day of collection or stored in a refrigerator at 4°C for processing next day. Identification of the eggs was made on the basis of their morphology using keys given by Soulsby [10].

Data Analysis: Data on individual animals and parasitological examination results was entered into Ms-excel spread sheet program to create a database. Descriptive statistical tools such as frequency tables, percentages, were used to describe the data. The data were analyzed statistically using the Chi-square test (SPSS statistics 17.0). Differences between parameters were tested for significance at probability levels of 0.05 or less.

RESULTS

The coprological examination conducted on 388 fecal samples revealed an overall prevalence of GI nematode infection of 27.57% (107/388). Variation had been observed on the occurrence of different types of GI nematode parasites. Three GI nematode egg-types were detected: *Ascaris* (57%), *Strongyle*-type (56.07%) and *Trichuris* spp. (16.82%) (Table 1). The incidence of *Ascaris* was highest followed by *strongyles* and *Trichuris* with a significant difference between them (P<0.05). Most of the cattle (71.02%) were infected by single GI nematode while the remaining (28.97%) were infected by two and three types of GI nematodes where most of the combinations were *Strongyles, Ascaris* and *Trichuris*.

A significantly higher prevalence (P < 0.01) of infection with GI nematodes was recorded in calves (41.30%) than in young (34.1%) and adults (23.07%). The prevalence of strongyle infection was significantly higher (P<0.05) in the adults (65%) compared with either the calves (10%) or the young (25%). *Trichuris* spp. made only minor contribution during the survey (Table 2).

Prevalence of GI nematodes was 29.9% and 25.3% in males and females, respectively. However, there was no statistically significant sex-related difference (P>0.05) (Table 2). There was a statistically significant variation (P<0.05) among the different body condition animals, where highest prevalence was recorded in poor (65.1%) followed by medium (26.3%) and good (13.6%) body condition animals (Table 2). For both breeds of cattle, there was a significant difference in prevalence (<0.05) of GI nematode infections with infection rate 33.04% and 19.6% for local and cross breeds, respectively (Table 2).

Table 1: Prevalence of Strongyle, Ascaris and *Trichuris* Eggs in Relation to age and Sex

	Age groups			Sex		
Parasite species	< 1 year	1-3 years	> 3 years	Male	Female	Total
Strongyles	6(10%)	15(25%)	39(65%)	38 (63.33%	22(36.66%)	60
Ascaris	15(24.59%)	18(29.50%)	28(45.90%)	32(52.45%)	28(45.9%)	61
Trichris	3(16.67%)	7(38.89%)	8(44.44%)	11(61.11%)	7(38.88%)	18

Table 2: Prevalence of GI nematode parasites based on different risk factors

Risk factors	No. of examined Animals	No. of animals Positive	P-value
Age			
Calf (<1year)	46(11.85 %)	19(41.30%)	0.013
Young (1-3years)	82(21.13 %)	28(34.14%)	
Adult (>3years)	260 (67.01%)	60(23.07%)	
Sex			
Male	194 (50%)	58(29.89%)	0.864
Female	194 (50%)	49(25.25%)	
Body condition			
Poor	63 (16.24 %)	41(65.07%)	
Medium	171 (40.07%)	45(26.31%)	0.000
Good	154 (39.69%)	21(13.63%)	
Breed			
Local	230(59.28%)	76(33.04%)	
Cross	158(40.72%)	31(19.62%)	0.002
Total	388	107 (27.57%)	

DISCUSSION

The current study revealed an overall prevalence of 27.57%. GI nematode infection of cattle. This result is lower than reports of Pfukenyi *et al*. [15], (43%) in Zimbabwe and Waruiru *et al*. [16] 85.5% in Kenya.

In this study, the GI nematode parasites identified were *Ascaris, strongyles* and *Trichuris* with the prevalence of each of the parasites 57, 56.07 and 16.82%, respectively as single and mixed infections. In the case of *Trichuris,* the prevalence disagrees with reports of Fikru *et al*. [5], in western Oromia (1.6%) and that of Etsehiwot-(1.2%) [17]. This might be due to differences in the study design and ecology, season, management system and sample size differences. From a mixed infection strongyle and *T.vitularium* found to be higher (14.0%) followed by *T.viularium* and *Trichuris* (10.3%), *strongyle* and *Trichuris* (3.7%), *strongyle*, *T.vitularium* and *Trichuris* (0.9%). The existence of more than one nematode species in a host has an additive pathogenic effect on the host and the pathogenecity is usually high [18] and Ethiopia is a country where extremes of temperature and rain fall are experienced, altitude being the most important factor [19]. These could be crucial elements influencing the development, distribution and survival of nematode parasites [18]. On the other hand, a variety of factors such as host age, sex, body condition and breeding status, grazing habits, the level of education and economic capacity of farmers, the standard of management and anthelmintic used can influence the prevalence of nematodes.

The present study clearly demonstrated the effect of age on the occurrence of GI nematodes with the prevalence being highest in animals aged less than 1 year (41.30%) followed by young (34.1%) and adult (23.07%) cattle. This finding is in agreement with the earlier reports of Anene *et al*. [20] and Waruiru *et al*. [16], which showed that the susceptibility and pathogenicity of nematode infections were greater in young animals than in mature animals. This also could be due to the fact that younger animals are more susceptible than adult counter parts. Because age has an effect on responsiveness or to the development of immunity causing lower worm fecundity in adult animals [21, 22]. Adult animals may acquire immunity to the parasites through frequent challenge and expel the ingested parasite before they establish infection [23, 24], But the findings of this study are in consistent with reports from Gambia were adults and older animals bear high worm burden [25]. The prevalence recorded in relation to calves in this study is lower than the 56.25% and 69.2% reports of Bilal *et al*. [26] in Pakistan cow calves and Maichomo *et al*. [27] in calves in Kenya, respectively. This could be due to differences in agro-ecology of the study areas, the management systems and sample size taken.

In this study, there were no sex-related differences in the prevalence of GI nematodes in cattle ($P>0.05$). The absence of association between sexes in the prevalence of GI nematodes in cattle is in agreement with that of Fikru *et al*. [5] in western Oromia and elsewhere outside Ethiopia [28] 62% of yearling and 64.6% of calves in western Canada, Bilal *et al*. [26] 69.5% in calves in areas of Pakistan. The observed differences in prevalence between the present and previous studies may be due to variations in geographical and climatic conditions

The study further revealed that body condition of the animal did not show significant association with the prevalence of the parasites. Poor body condition animals have higher prevalence than medium and good body condition animals (65.1%, 25.3% and 13.6% respectively). This could be explained by the fact that loss of body condition in the study animals could be due to GI nematodes. However, the prevalence in body condition disagrees with previous reports of Fikru *et al*., [5] but agrees with that of Keyyu *et al*. [29].

A significant difference ($p<0.05$) was also found in infestation levels in different breeds where a higher infection rate was recorded on local breed cattle (33.0%) compared to cross breed cattle (19.6%). This may be due to a difference in management system. But the prevalence of GI nematode infection in relation to cross breed cattle was lower than the reports of Adem and Wondimu [9] on Holstein Friesian dairy breed (54%) of Haramaya University dairy farm. This variation may be due to the difference in management system between the two areas. Therefore, this study identified the potential risk factors associated with high prevalence rate and enabling to design feasible and strategic control of nematode parasites of cattle in areas of similar ecological features.

CONCLUSION AND RECOMMENDATIONS

The gastrointestinal parasites are - the major problems in young animals in the area that could cause major economic loss in the cattle production due to stunted growth, insufficient weight gain, poor food utilization and mortality and losses associated with control measures and treatments. The prevalence of

the nematodes infections of cattle in Gondar town indicates the significance of these parasites by hampering growth, productivity and reproductive potential of the cattle in the area. The predominant nematode parasites in cattle in the study area were *Ascaris* followed by strongyle and *T. trichuris*. The role of cattle in the contribution of the country's economy and individual cattle owners is said to be high. In order to benefit from cattle, attention should be given and more works are expected to emerge.

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

- To reduce the risk of reinfection and pasture contamination strategic anthelmimtic treatment should be implemented in the study area.
- Awareness creation among the livestock owners on the proper management, feeding and use of anthelmintics should be performed.
- Further studies are needed to establish the seasonal epidemiology of these parasites. Such information will be important in designing an integrated control program for these parasites.

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