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Prevalence and Risk Factors Associated with Gastrointestinal Nematode of Small Ruminants in and Around Nekemt, Oromia, Western Ethiopia

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Abstract: A study was conducted to determine the prevalence and risk factor associated with gastrointestinal nematode of small ruminants in and around Nekemt from October 2009 to February 2010. A total of 763 small ruminants (387 sheep and 376 goats) were included in the study using standard coprological parasitological procedure. The study showed that the overall prevalence of gastrointestinal nematode was 64.4% with 65.5% and 62.5% in sheep and goats respectively. A higher rate was recorded in sheep than goat and a greater proportion of study animals (91.6%) had low Egg Per Gram compared with study animals with moderate to severe Egg Per Gram (8.4%). The present study indicated age, sex, season and species of animal as important risk factor that influence Gastro Intestinal Tract nematode infections in small ruminants in study area but only season significantly influence the prevalence. This difference need to be taken in to considerations while designing controls measures for GIT nematidosis of small ruminant unique to this climatic zone and other parts of the country with similar climate and husbandry production Systems.

Key words: Nematode · Small Ruminant · Nekemte · Prevalence · Risk Factors

INTRODUCTION

Sheep and goat are the first animals to be domesticated. Archeological evidence suggest the sheep where being raised for wool production as 4000 Bc, while goat remain have been dated between 6000-7000 B.C [1]. The contribution of livestock to the human being particularly in the developing countries is numerous and small ruminant production is an important component of livestock production in Africa [2]. Small ruminants in Africa represent 21% of the world's small ruminant population (sheep, 17% and goats, 30% of the world's sheep and goats respectively) [3].

Highly adaptive nature to range of environments, ability to utilize wide variety of plant species, short generation cycle and high reproductive rates which lead to high production efficiency made goats complementary to cattle and camel [2, 3]. Sheep and goat are a major source of income (cash) and food protein for rural farmers in most part of tropics including Ethiopia and skin, fiber manure and as an investment [4]. However, the full exploitation of these resources is hindered in the tropical environment and particularly in Africa due to a combination of factors such as drought, poor genetic potential of the animals, traditional system of husbandry and the presence of numerous prevalent diseases [5].

In most sheep production areas, internal or gastro- intestinal parasites (i.e. worms) are usually the primary disease affecting sheep and lambs. Sheep are more susceptible to internal parasites than most other types of farm livestock for several reasons. Their small fecal pellets disintegrate very easily thus releasing the worm larvae on to pastures, they graze close to the soil surface and to their feces; they are slow to acquire immunity [6].

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Gastrointestinal parasite infections are a worldwide problem for both small and large scale farmers. But their impact is greater in sub- Saharan Africa in general and Ethiopia in particular, due to availability of wide range of gastrointestinal parasite in a variety of ways they cause loss through lowered fertility, reduced work capacity, involuntary culling, a reduction in food in rake and lower weight gains, lowered milk production, treatment cost and mortality in food intake and lower weight gains, lowered milk production, treatment cost and mortality in heavily parasitized animals [2].

GIT nematodes disrupt the nutrient utilization of grazing ruminants resulting reduced growth and productivity by infected animals. By far the most important helminthes infection of livestock is infection of grazing ruminants by nematode residing in GIT of vertebrate host. Because these parasites are the most economically important helminth parasitosis, they have received the bulk of attention both in terms of research effort and in terms of commercial interest in product to control the infection [7, 8].

GIT nematode infections of ruminant remain a major constraint to efficient rising of livestock throughout the world. In the USA alone it is estimated that these parasite cost the American US$2 billion per year in lost productivity in increased operating expense [8]. The economic loss to the Ethiopian meat industry die to parasitic disease is estimated at US$400 million annually [9].

Some of the major nematodes responsible for GIT parasitosis in small ruminants under tropical environment are: *Haemonchus, Trichostrongylus, Nematodirus* and *Coopera* spp. (Family: Trichostrongylidae); *Bunostomum trigonocephalum* and *Gaigeria pachyscelis* (Ancylosomatidae); *Chabertiaovina* and *Oesophagostomum* spp (Strongylidae); and *Trichuris* and *Strongyloides* spp [10].

In Ethiopia, helminth infections in ruminants are characteristically chronic and insidious in nature. The parasites attract very little attention, including research funds, when compared with viral, bacterial and some protozoan diseases. This is despite of the fact that they undoubtedly exert a heavy toll on the health and productivity of a vitally important livestock resource with obvious implications for the rural and national economy of the country. Gastro intestinal parasites are a worldwide problem for small and large scale farmers and their impact is major for sub-Saharan Africa in general and Ethiopia in particular. This is due to the range of agro ecological factors suitable for diversified host and parasite species [2].

A number of attempts have been made so far to identify the different genera and species of nematodes in small ruminants and determine the prevalence both by coprology and post mortar examination. The report made by Graber was one of the earliest and extensive attempts in describing the different type's helminthes parasites of domestic animals including that of small ruminants from different parts of Ethiopia [11]. The existence of *H. contortus*, *Oe, columbianum, S. papillosus, Oe, venulosum, C. ovina, Skrjabinema ovis, B. trigonocphalum, Trichostrongylum spp., Teladorsagia spp.* and *Trichuris spp*. reported from Oromia (Yabello, Debre Zeit, Bale); SNNPRS (Sidamo, Gamo Gofa): Amhara (Debre Berhan, Wollo, Kombolcha, Shoa) and Somali region (Ogaden) [12]. However; there is little information on the small ruminant Nematidosis in and around Nekemte, Thus the objectives of the present study were:

- To determine the overall prevalence of small ruminant Nematidiosis
- To assess the nematode egg count in both goat and sheep.

MATERIALS AND METHODS

Study Area: The study was conducted from October 2009 to February 2010, in and around Nekemte, which is found in East Wollega Zone, Oromia regional state. Nekemte is the Zonal Town of East Wollega. The town is situated 328km west of the capital city of Ethiopia, Addis Ababa. East Wollega Zone comprises 17 districts including Nekemte and agro- climatically divided in to highland ('Dega') which accounts for 0.26%, mid highland ('Weyna dega') which covers 46.74% and lowland ('Beraha') which accounts for 53% of the Zone. Mixed crop and livestock farming system is the mode of agriculture in the zone. The major crops that are grown in the area include sorghum, maize, barley, wheat and teff [13].

The approximate geographic location of the area is between 9°4'N to 'N and 36°30'E to 36°43''E. The area has an altitude ranging from1500 to 2565m asl and receives relatively high amount of rainfall, with balanced distribution pattern. According to available data, the mean

annual rainfall ranges from 1600 mm to 2000 mm. The area receives long heavy rainy season from June to September and short rainy season from March to May. Long - term annual mean temperature of the area ranges from 10.2°C to 27.4°C. Among the various soil types in the area, the red brown soil with a pH ranging from 5-7 is the predominant type of soil in the region. The area is rich in natural vegetation that comprised of the tropical rain forest tree, all grasses and bushes. The total land area of the region is about 769,725. The total livestock population of study area is1,172,691 and this include 86,783 cattle, 135,892 sheep, 101, 288 Goats 7,824 Horse 52,987 Donkey 6,853 Mule, 51,7074 Poultry and 90,000 human population [13].

Study Population: The local breeds of goats (376) and sheep (387) of different sex and age groups were used in this study.

Study Design and Sampling Method: The study was done on animals, which come to Nekemte veterinary clinic for various reasons. The study under taken was a cross sectional type and simple random sampling technique was used to take fecal samples from the study population.

Sample Size Determination: The sample size was determined by the following formula Thrustfield [14].

$N = 1.96^2 \times PQ/D^2$

where N is required sample size, P is expected prevalence based on previous preliminary surveys, Q is 1-P and D is the level of precision (5%), 1.96 to indicate 95% confidence level. 50% prevalence was taken as previous prevalence for both species of animals.

Data Collection: History, management system, sex and age of individual animal and other information was taken and all the information was attached with sample and sent to laboratory. Clinical examination was conducted in Nekemte veterinary clinic. All the results were recorded and analyzed.

Nematode Identification: After collection and preservation of feces, floatation and Mc master egg count was used fecal samples for parasitological examination were collected directly from rectum of the study animals and parasite egg identification was done according to Hansen and Perry [15]. Calcification of the intensity of infection was made based on fecal egg counts as light (50-800 epg), moderate (801-1200 epg) and heavy infections (>1200 epg) as described by Jorgen and Brian [16] for the mixed infections in grazing small ruminants.

Data Analysis: The collected data was entered in to a computer on a Microsoft Excel spreadsheet. Statistical analysis was performed using 'Statistical package for the social sciences' (SPSS). Categorical variables (species, sex, age and season) were expressed in percentages. The prevalence proportion was calculated as the number of animals positive for nematode egg by floatation technique, divided by the total number of animals tested. The association between each risk factor and the outcome variable was assessed using the Chi – square and t-test was used for EPG count. For all analyses, a P-value of less than 0.05 was taken as significant.

RESULTS

Prevalence: Analysis of data revealed that, 491 (64.4%) samples were found to be infected with nematodiosis. The greater proportion of study animals (91.6%) were with low EPG while fewer (8.4%) were with moderate to severe infection rates.

Species and Prevalence: The rate of infection in species (sheep & goats) was assessed and the prevalence between the group was statistically insignificant (P>0.05). There were also no statistical significance observed between EPG of the two species (p>0.05).

Age and Prevalence: The prevalence was also assessed in terms of age and it was found that adult animals (Sheep and goats) has higher prevalence rate (65.5%) followed by young animals (62.5%). However the deference in prevalence rate between age groups was statistically insignificant (P = 0.239, x^2= 1.389).

Sex and Prevalence: Sex wise observation revealed the prevalence of GIT nematode more in female than male (Table 2). However, the observation were statistically insignificant (P>0.05).

Influence of Season on the Prevalence of Nematodes: The data pooled for monthly estimation of nematode infection revealed definite monthly of infection in sheep and goat over periods of five months with higher infection in October and November followed by January and February (Table 3) the difference in prevalence rate among difference month was statistically significant (P=0.00, x^2 = 52.600).

Table 1: Prevalence of small ruminant nematodiosis and degree of EPG between species

		EPG category %			
Species	Prevalence	Light	Moderate	Severe	Total
Sheep	66.9(259)	236(91.1)	18(6.9)	5(1.9)	259
Goat	61.7(232)	214(91.8)	10(4.3)	8(3.4)	232
Total	64.4(491)	450(91.6)	28(5.7)	13(2.6)	491

P- Value = 0.35, x^2 =1.10

Table 2: Prevalence of small ruminant nematodiosos and degree of EPG between sex and age group.

Animals		Prevalence %	EPG category %			Total	P-value	x^2
Sex	Male	63.1	94.1	4.07	1.8	221	0.239	1.389
	Female	65.5	89.6	7.03	3.3	270		
Total		64.4	91.6	5.7	2.6	491		
Age	Young	62.2	91.4	5.4	3.1	258		
	Adult	66.5	91.8	6	2.1	233		
Total		64.4	91.6	5.7	2.6	449		

Table 3: Prevalence of small ruminate Nematodiosis in different months of study period

	Number of animal examined				
Months	Negative	Positive	Prevalence %	P-Value	X^2
October	45	36	80.0	0.00	52.6
November	220	164	74.5		
December	152	105	69.0		
January	100	40	40.0		
February	121	67	52.8		
Total	763	491	64.4		

DISCUSSION

This study revealed that over all prevalence of GIT nematode of small ruminant to be 64.4% with 69.5% in sheep and 62.3% in goats. The present study disagree with previous findings in different part of the country and other parts of the tropical countries Ibrahim [10], Abede and Esayas [17], Dabasa *et al*. [18], Genene [19], Bonfoh *et al.* [20] (in Togo), Esayas [21], Jacquiet *et al.* [22] (in Mauritania) and Haileleul [23] (in southern Ethiopia) in which they report high prevalence when compared with the present study. This may be due to different management system in different part of the country and most probably, this low prevalence (in the study area) is may be the farmers are practicing deworming.

In Ethiopia different studies also reported that ovine gastrointestinal Nematodiosis exist almost in all part of the country. The result of present study has revealed low prevalence of ovine nematodiosis (64.4%) when compared with other report 86.62% in and around Nekemte (the same study area) [24], 92.43% in around Komblcha, Genene [19], 91.23% in Ogaden sheep [4]. Other studies reported 64.3% in Easter and Southern Semi-arid zone of Ethiopia Donald [25] and 75.3% in Western Oromia [2].

The deference in the prevalence of Nematodiosis in different region of the country may be due to difference in management system of the animals. In Eastern Ethiopia, animals are managed under extensive pastoralism in which large numbers of the animals are kept together. This could increase pasture contamination leading to higher prevalence rate where as in western part of Ethiopia mixed crop livestock production predominates, where few numbers of various species of livestock are kept together.

The prevalence between sheep and goat was assessed that higher prevalence were recorded in sheep than goat (P>0.05). This is due to grazing behavior of these two animals. The goats are browsers and the chance of getting being infected will be decreased in this animal. This study also disagrees with work of Regasa *et al.* [2].

Sex wise observation revealed the prevalence of GIT nematode more in female than male. However, the observation were statistically insignificant ($p>0.05$) and disagree with work of Tariq *et al*. [26] who reported prevalence of nematode infection of sheep higher in rams than in ewes ($p>0.05$), agree with work of Regasa *et al*. [2] who reported higher prevalence rate of infection in female. The prevalence rate in age also assessed that higher in adult than young animal ($p>0.05$). This study also disagree with Kidist [27] which they report higher prevalence in young than adult.

The seasonal (monthly) difference in prevalence of nematode indicated significant variation ($P<0.05$) between months. This agrees with findings of Nwosu *et al*. [28] in Nigeria: Tembely *et al.* [29] at Debre - Berhan of Ethiopia and Magona and Musisi [30] in Uganda: who indicated significant seasonal differences in overall nematode prevalence.

The coproscopic finding of a significant increase ($P<0.05$) in late wet season (October and November) (77.25%) compared with 46.2% prevalence in early dry season (January and February) which is in line with the idea of Yoseph [31] and Kidist [27] which they report a significant increase ($P<0.05$) in early dry season compared prevalence in late wet season. The present study may be due to the parasite egg may suffer from change in temperature and humidity form wet to dry season. Thus, the life cycle of nematode egg disturbed, as they require sufficient humidity (100%) and temperature (25°C).

CONCLUSION

The study carried out in and around Nekemte has revealed the wide spread existence of nematode parasites (Nematodiosis). The overall high prevalence of GIT Nematodiosis is 64.4%. Mean nematode of fecal egg count was varied in different months and sex group. From the results of the present study, GIT nematodiosis of sheep and goats in the study area was found to be one of the major problems that hampered efficient utilization of the available small ruminant resources at hand and thus requires serious attention by all concerned bodies or institution to properly address and give solutions to the problem.

Based on the above facts and conclusion:

- Strategic treatment using broad spectrum anthelminthic should be practiced.
- Further detail epidemiological studies should be conducted in the area.

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