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Helminth Parasites in Small Ruminants: Prevalence, Species Composition and Associated Risk Factors in and Around Mekelle Town, Northern Ethiopia

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Abstract: A cross sectional study was conducted from November 2011 to March 2012 to determine the prevalence of gastrointestinal (GI) helminth infections and associated risk factors in sheep and goats in and around Mekelle town, northern Ethiopia. A total of 390 small ruminants' faecal samples (240 sheep and 150 goats) were collected and examined using standard parasitological procedures. The study revealed that the overall prevalence of helminthiasis was 56.25% and 35.33% in sheep and goats, respectively. A statistically significant difference ($p<0.05$) was found in prevalence between sheep and goats. Strongyles were the most prevalent parasites encountered in the study area followed by *Trichuris* spp. Sex and body condition of the animals were shown to have association with prevalence and significant difference ($p<0.05$) was also found. A statistical significant difference was not observed ($p>0.05$) in prevalence with age of animals. Potential risk factors for the occurrence of the disease should be considered in designing strategic anthelmintic treatment.

Key words: Helminthes · Prevalence · Small Ruminants · Mekelle · Ethiopia

INTRODUCTION

Ethiopia possesses the highest number of livestock population in Africa. Sheep and goats are among the major economically important livestock in Ethiopia; in which there are 23.62 million sheep and 23.33 million goats, playing an important role in the livelihood of resource poor farmers and provide a vast range of products and services such as meat, milk, skin, hair, horns, bones, manure and urine, security, gifts, religious rituals and medicine [1].

Parasitism is of supreme importance in many parts of the world and still a serious threat to the livestock economy worldwide [2]. Gastrointestinal helminthes 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 factors suitable for diversified hosts and parasite species. Economic losses are caused by lowered fertility, reduced work capacity, involuntary culling and reduction in food intake, lower weight gains, lower milk production, treatment losses and mortality in heavily parasitized animals [3].

Although quantitative data on direct and indirect losses due to helminth parasites in small ruminants in Ethiopia is scanty. Available information indicates that the parasites occur in all ecological zones and production systems and economic losses may be high due to both clinical chronic and sub clinical infections [4]. However, in the study area there was no detailed recent study on the prevalence of these parasites. Therefore, the objective of the current study was to determine the prevalence of gastrointestinal helminth parasites and associated risk factors in small ruminants.

MATERIALS AND METHODS

Study Area: A cross sectional study was conducted from November 2011 to March 2012 to determine the prevalence of GI helminth parasites in and around Mekelle

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town, northern Ethiopia. Mekelle is located 30° 32'N, 39° 78'E, at 783 km North of Addis Ababa. The area has an average altitude of 2135 m.a.s.l. and with a range of temperature between 11.4°C-26.73°C. The annual rain fall ranges between 579-650 mm and has bimodal rain fall with a short rainy season occurring from March to May and long rainy season from June to August followed by the dry season from September to February [5].

Study Animals: The study animals were local breeds of small ruminants (sheep= 240 and goat=150) managed under semi-intensive and extensive husbandry system. Animals were composed of different age and body condition groups and both sexes. The age of animals was determined based on dental eruption pattern [6]. Animals up to 6 months of age were considered as young and those greater than 6 months were adult. The body condition score was determined according to Kripali *et al*. [7] and were grouped as poor, medium and good.

Study Design and Sample Size Determination: A cross sectional study design was used to determine the prevalence of GI helminthes of small ruminants in and around Mekelle town based on coprological examination. Simple random sampling technique was used to select study animals. Age, sex, species and body condition score were considered as risk factors for the occurrence of helminth infections in small ruminants. The sample size was calculated according to Thrusfield [8] using 50% expected prevalence with 5% absolute precision at 95% confidence interval.

Sample Collection and Examination Procedures: Fecal samples were collected from 390 small ruminants (240 sheep and 150 goats) per rectum using gloved fingers, put in sampling bottles containing 10% formalin and labeled. The age, body condition, sex and species were recorded. Finally samples were transported to Mekelle Veterinary Regional Laboratory for laboratory analysis. In the laboratory, preserved fecal samples were examined for detection of helminth eggs using standard procedures of flotation and sedimentation methods and were identified based on their colour, shape and contents as described by Soulsby [9].

Data Analysis: The data was entered and managed in excel worksheet and the analysis was conducted using SPSS statistical soft ware version 17.0. Chi-square (χ^2) test was used to measure statistical significance of the result. P-value less than 0.05 were considered as significant.

RESULTS

Out of the total 390 examined faecal samples, 188 (48.21%) were positive for GI helminthes eggs in both species of animals. The prevalence was higher in sheep (56.25%) than goats (35.33%) with a statistical significant difference (χ^2=16.75, $p<0.05$) between them. The identified helminth parasites were of strongyles, *Fasciola* spp., *Paramphistomum* spp., *Trichuris* spp. and *Moniezia* spp. as single and mixed infections (Table 1).

From 240 sheep examined for GIT helminth parasites 135(56.25%) were infected with at least one species of helminth parasite and 68(50.37%) were infected with two or more species. Out of the total 150 examined goats, 53(35.33%) were infected with at least one species while 19(35.84%) were infected with two or more species of GI helminthes (Table 1).

Among age groups, higher prevalence (54.90%) was observed in young animals than adults (45.83%). Younger animals tend to be more susceptible to helminthiasis as compared to adults. However, the difference in prevalence between the two age groups was not statically significant (χ^2=2.481 and $p>0.05$) (Table 2).

The higher prevalence of GI helminth infection was observed in female animals (53.35%) compared to males (34.58%). The difference was statistically significant (χ^2 = 10.965 and $p<0.05$). The higher prevalence of helminthiasis was observed in poor body condition animals (97.77%) compared to medium (60.71%) and good (35.63%) body conditioned animals. There was a statistical significant difference (χ^2=66.080 and $p<0.05$) between different body condition scores (Table 2).

DISCUSSION

The present study revealed the existence of GI helminth parasites with an overall prevalence of 48.21% in small ruminants. This finding is lower than the results of previous surveys in sheep and goats [10-14] in different parts of Ethiopia. This deference could be due to the existence of unfavorable climatic or environmental factors that could support prolonged survival and development of infective larval stage of most helminths [15, 16]. Furthermore, management system of animals could also contribute in the difference of the prevalence [12].

Table 1: Prevalence of GIT helminth parasites based on species of animals and species of parasites

Species	Examined No.	Infected No.	Strongyle	*Fasciolla*	*Paramphistomum*	*Trichuris*	*Monezia*	Mixed infection
Sheep	240	135 (56.25%)	76 (56.29%)	38 (28.14%)	20 (14.81%)	53 (39.25%)	21 (15.55%)	68 (50.37%)
Goat	150	53 (35.33%)	24 (45.28%)	11 (20.75%)	5 (9.43%)	24 (45.28%)	8 (15.09%)	19 (35.84%)

Table 2: Prevalence of small ruminant helminthiasis based on risk factors

Risk factors	No. examined	No. infected (%)	χ^2	P-value
Sex				
Male	107	37 (34.58%)	10.965	0.001
Female	283	151 (53.35%)		
Total	390	188 (48.2%)		
Age				
Young (up to 6 month)	102	56 (54.90%)	2.481	0.115
Adults (>6 month)	288	132 (45.83%)		
Total	390	188 (48.2%)		
Body condition				
Good	261	93 (35.63%)	66.080	0.000
Medium	84	51 (60.71 %)		
Poor	45	44 (97.77%)		
Total	390	188 (48.2%)		

In the present study, a higher prevalence of GI helminth parasites was observed in sheep than in goats which is in agreement with the work of Tekly [17] in Ethiopia and elsewhere in the world [18, 19]. This is assumed to be due to the grazing habit of sheep where they graze closer to the ground fostering opportunity of exposure to parasites. However, it is in contrary to other reports [10, 12] in western and eastern parts of Ethiopia and abroad [20]. In this regard, beside the grazing habit of the sheep, the communal grazing area of sheep and goats practiced in the study area could put the goats in a risk of acquiring the infection from sheep [21]. Furthermore, it is assumed that sheep do have a considerably higher immunological response to gastrointestinal parasites compared with that of goats [22].

In this study, a significant difference was observed in helminth infection in relation to body condition where a higher prevalence of helminthiasis was recorded in poor body condition animals compared to other groups. This agrees with Keyyu *et al.* [20]. This poor body condition might be due to malnutrition, other concurrent disease or the current parasitic infection which lead to poor immunological response to infective stage of the parasites.

In the present study, animals with young age seems to have higher prevalence of helimenthiasis, which could be related to their higher susceptibility to infection than adults but it is not statically significant. This is in agreement with reports in Ethiopia [12, 21] and elsewhere in the world [20, 23-25]. A number of authors have demonstrated an increased prevalence in young age [26]. Asanji and Williams [27] also stated that young animals are highly susceptible due to immunological immaturity and immunological unresponsiveness. Urquhart *et al*. [22], Taswar *et al*. [28] and Dagnachew *et al*. [21] have documented that adult and old animals develop acquired immunity against helminth infections as they get mature due to repeated exposure and this will help expel the parasite before it establishes itself in the GIT. On the contrary, there are instances where younger animals were reported to be resistant to parasitic infection [27].

Female animals showed a higher infection rates than males with a significant difference between them. It is assumed that sex is a determinant factor influencing prevalence of parasitism [29] and females are more prone to parasitism during pregnancy and per-parturient period due to stress and decreased immune status [22]. Dagnachew *et al*. [21] reported a higher prevalence of helminth infection in females.

The coprological investigation in the present study revealed the presence of Strognyles, *Trichuris* spp., *Fasciola* spp., *Paraphistomum* spp. *and Monezia* spp. as single and mixed infections in both sheep and goats. The helminths found in this study have also been reported previously in other parts of the country [12, 14, 21] and abroad [18, 25, 30]. Among the recorded helminthes, in the currrent study, the nematodes account the highest followed by trematodes and the least were cestodes. This finding is in agreement with other studies [14].

The current study has shown the presence of mixed infection characterized by the presence of two or more helminth parasites both in sheep and goats which agrees with the findings of other researchers in the country

[10, 12-14] and elsewhere [18, 19, 25, 30]. These Mixed infections have been suggested to be an important cause of morbidity and loss of production in sheep and goats [14]. Moreover, the presence of interaction and compromization of the immune system of the host by mixed infections described increase in their susceptibility to other diseases or parasites [31].

CONCLUSION

The present study showed that helminthiasis of small ruminants is prevalent disease in the area affecting the well being of the animals. Potential risk factors for the occurrence of the disease should be considered in designing strategic anthelmintic treatment.

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