Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.7, No.7, 2017

Prevalence of Haemonchosis and Associated Risk Factors in Small Ruminants Slaughtered at Bishoftu ELFORA Export Abattoir, Ethiopia

Belete Abdo[1] Wale Tesfaye[2] Tilaye Shibbiru[2*]
1.Fantale Pastoral District Veterinary Clinic, Ethiopia
2.School of Veterinary Medicine, Wolaita Sodo University, Ethiopia

Abstract
Haemonchosis have been recognized as a major constraint to both small and large-scale small ruminant production in developing countries. A cross- sectional study was carried out in sheep and goats from November 2015 to April 2016 in Debrezeit ELFORA export abattoir in Bishoftu town, with the objectives of evaluating the status of *H. contortus* and determining the associated risk factors. The study animals were 845 small ruminants in which 425 male sheep and 420 male goats slaughtered in the abattoir. The study revealed that an overall prevalence of 63.4% in the study abattoir. Of the examined animals, 296 (69.6%) sheep and 240 (57.1%) goats were found positive for the parasite. There was statistically significant difference ($p<0.05$) in infection rates between sheep and goat. The prevalence of haemonchosis in young and adult was 66.9% and 59%, respectively, and this difference was found statistically significant ($p < 0.05$). But there was no statistically significance ($p>0.05$) in *H. contortus* infection in animals with different body condition scores. In this study, as high rate of infection with *H. contortus* observed in small ruminants slaughtered in the study abattoir, appropriate control measure should be instituted in area of animals' origin to reduce further infection.
Keywords: Abomasum, Bishoftu; Goats, H. contortus, Prevalence, Risk Factors, Sheep

INTRODUCTION

Livestock production in Ethiopia's agricultural economy is an important sector providing a significant contribution to gross domestic and export products, and raw materials for industries (Jemere *et al*., 2011). There are about 25.5 million sheep and 24.06 million goats in the country playing an important role in the livelihood of resource poor farmers (Abay *et al*., 2015). Small ruminants are important source of income for agricultural community and are one of Ethiopia's major sources of foreign currency through exportation of live animals, meat and skin (Sheferaw *et al*., 2010).The contribution from this huge livestock resource to the national income is small due to several factors. The major constraints of small ruminant production in Ethiopia are diseases of various etiological origins, feed shortage and poor management (Jemere *et al*., 2011;Abay *et al*., 2015).

Parasitic diseases are a global problem and considered as a major constraints in the health and product performance of livestock (Melese *et al*., 2010). They cause lowered productivity and high economic losses affecting the income of small holder dairy farming communities (Dagnachew *et al*., 2011).

Haemonchosis is primarily a disease of tropical and sub-tropical regions. However high humidity, at least in microclimate of the feces and the herbage is also essential for larval development and their survival. The frequency and severity of the disease largely depends on the rainfall in any particular area. Sheep and goats suffer more frequently from haemonchosis (Nwosu *et al*., 2007). Therefore, the objectives of this study were to determine the prevalence of small ruminant haemonchosis and to evaluate the influence of host related risk factors on the occurrence of haemonchosis in small ruminants slaughtered at Debrezeit ELFORA export abattoir in Bishoftu, Ethiopia.

MATERIALS AND METHODS

Study Area

The study was conducted from November 2015 to April 2016 at Debrezeit ELFORA export abattoir in Bishoftu town, Ethiopia. The town is located 47 km South East of the capital Addis Ababa at 8° 44' N latitude and 38° 57' E longitudes, at an altitude of 1950 meter above sea level and experiences a bimodal rainfall pattern with a long rainy season from June to October, and a short rainy season from March to May. The average annual rainfall of the area is 800mm, and averages maximum and minimum temperature of the area are, 26 and 14^0C, respectively (CSA, 2010).

Study Animals

The study animals were 845 small ruminants of which 425were sheep and 420were goats slaughtered at Debrezeit ELFORA export abattoir. All animals were indigenous breeds managed under extensive production system.

Study Design
A cross-sectional study was carried out from November 2015 to April 2016.

Study Methodology
Ante-mortem Examination
Ante mortem examination was performed before the slaughtering process on randomly selected sheep and goats. Accordingly, age, origin, and body condition score of each selected animal was recorded on the sheet prepared for this purpose. The age of animals was estimated by using teeth eruption based on the method forwarded by Vatta *et al*., (2006). The body condition score was determined and grouped as medium and good based on method recommended by ESGPIP (2007).

Postmortem Examination
During postmortem examination, the abomasum was ligated at both ends to avoid leakage and separated from omasum and duodenum. Then the abomasum was opened along its greater curvature and close visualization was made for the presence of adult *Haemonchus* parasite. The abomasum wall and its contents were carefully observed for any gross pathological changes. The adult *H. contortus* worms were identified visually by standard method recommended by Urquhart *et al*., 2001.

Sample Size Determination and Sampling Techniques: For this study, the total population of sheep in the study area and expected prevalence of 50% was used using the 95% level of confidence. The calculated sample size was 384 based on the formula indicated by Thrusfield (2005) but it was increased to 845 in order to increase precision.

$$N = \frac{(1.96)^2 P \text{ expected } (1 - P \text{ expected})}{d^2}$$

95% = level of confidence, where n is sample size (384 animals), P is expected prevalence (50%), 1.96 is the value of Z of 95% confidence level, and d is desired absolute precision = 5%. Simple random sampling technique was used to select animals for the study.

Data Analysis
Raw data collected during the study period was entered in to Microsoft excel spreadsheet. Then, computation of descriptive statistics was conducted using IBM-SPSS version 20.0. The prevalence of the haemonchosis was calculated by dividing the number of sheep and goats harboring the parasite by the number of sheep and goats examined. Pearson's chi-square ($\chi 2$) to measure association between prevalence of the haemonchosis with the species, age, origin, and body condition was used. Confidence level was held at 95% and statistical analysis for the difference in prevalence of *H. contortus* among risk factors are considered significant at $P < 0.05$.

RESULTS
In this study a total of 845 sheep and goats were examined using postmortem examination for the presence or absence of *H. contortus.* The overall prevalence of haemonchosis in small ruminants was found 536 (63.4%) in the study area.
Table 1: Relative prevalence of Haemonchosis in sheep and goats at Debrezeit ELFORA export abattoir during 2015/16 at Bishoftu, Ethiopia.

Species	No of animals examined	No of positive	Prevalence (%)	Significance
Sheep	425	296	69.6%	$\chi 2$=14.239
Goat	420	240	57.1%	P=0.000
Total	845	536	63.4%	

The prevalence of haemonchosis was found higher in sheep (69.6%) than goats (57.1%). There was statistically significant difference ($P<0.05$) on the frequency of haemonchosis between the species of animals (Table 1).
Table 2: Relative prevalence of Haemonchosis based on age in sheep and goats at Debrezeit ELFORA export abattoir during 2015/16 at Bishoftu, Ethiopia.

Age	No of animals examined	No of positive	Prevalence (%)	Significance
Young	474	317	66.9%	$\chi 2$=5.526
Adult	371	219	59.0%	P=0.019
Total	845	536	63.4%	

In the present study, higher prevalence of haemonchosis infestation was observed in young (66.9%) than in adult animals (59.0%). The distribution of haemonchosis was statistically showed significant difference ($P<0.05$) between the age groups.

Table 3: Prevalence of Haemonchosis based on body conditions in sheep and goats at Debrezeit ELFORA export abattoir during 2015/16 at Bishoftu, Ethiopia.

BCS	No of animals examined	No of positive	Prevalence (%)	Significance
Medium	494	320	64.8%	$\chi 2=0.928$
Good	351	216	61.5%	P=0.335
Total	845	635	63.4%	

Although haemonchosis was slightly prevalent in medium (64.8%) than good body conditioned animals (61.5%), there was no statistically significant difference (P>0.05) in prevalence of the infestation between animals with different body conditions.

Table 4: Prevalence of haemonchosis based on origin of sheep and goats slaughtered at Debrezeit ELFORA export abattoir during 2015/16 at Bishoftu, Ethiopia.

Origin	No of animals examined	No of positive	Prevalence (%)	Significance
Negelle Borana	212	117	55.2%	$\chi 2=14.944$
Ginka	208	123	59.1%	P=0.001
Yabello	425	296	69.6%	
Total	845	536	63.4%	

The highest prevalence was observed in animals that were brought from Yabello (69.6%) followed by animals originated from Ginka (59.1%) and Negelle borana (55.2%). There was statistically significant variation (P<0.05) in prevalence of haemonchosis among animals of different origins.

DISCUSSION

The current study revealed an overall prevalence of63.4% for haemonchosis in small ruminants slaughtered at Debrezeit ELFORA export abattoir located at Bishoftu, Ethiopia. The prevalence among animals' species was 69.6% in sheep and 57.1% in goats. This finding was lower than the results of Argaw *et al* (2014) who reported 90.1% and 81.8% in sheep and goats slaughtered at Haramaya municipal abattoir, eastern Hararghe.Similarly, Abebe and Gelaye (2001) reported 96.5% haemonchosis in sheep and 100% in goats in the arid and semi-arid zone of eastern Ethiopia. Another study conducted by Kumsa and Abebe (2006) showed higher prevalence of 91.2% in sheep and 82.9% in goats of Ogaden region slaughtered at Debre-zeit ELFORA export abattoir. Mengist *et al* (2014) reported prevalence of haemonochosis among small ruminants as 71.03% in and around Finoteselam. Shankute *et al* (2013) also reported higher prevalence in the study of An Abattoir Survey on Gastrointestinal Nematodes in Sheep and Goats in Helmex-Export Abattoir as 77.38%. Those differences could be due to the difference between the management system of examined animals, sample size and geographical and environmental location of the areas.

The prevalence of *H. contortus* in sheep and goats was recorded as 69.6% and 57.1% respectively. There was significant difference (P<0.05) in the prevalence of haemonchosis between sheep and goats, indicating that sheep's are more susceptible to the infection than goats. The results of the present study were supported by Fentahun and Luke (2012) who reported 81.2% and 73.5% in sheep and goats respectively in Gonder town; Mulugeta *et al* (2011) who reported 69.5% and 65%in sheep and goats in and around Bedelle; Nigussie (2002) who reported 61.63% and 54.76% in sheep and goats respectively in and around Wolaita Soddo, Ethiopia. In contrary to our current findings, Mengist *et al* (2014) reported that the rate of the parasite was higher in goat compared to sheep with the prevalence of 71.3% and 67.57%, respectively. The higher prevalence of haemonchosis in sheep than goats might be attributed to a variety of factors like ground grazing habit of sheep and usually graze very close to the soil which might be helpful in the acquisition of more infective larvae (L3) of *H. contortus* from the contaminated herbage. Such differential prevalence in sheep and goat also might be due to the fact that goats browse on shrubs and small trees where translation of infective larvae to such height seems impossible (Badaso and Addis, 2015)

The present study revealed that there was significant difference based on age (P < 0.05) with the prevalence of 66.9% and 59.0% in young and adults, respectively. The present finding on the prevalence of haemochosis between two age groups was in line with previous findings which were reported by Shankute *et al* (2013) as 86.9% and 86.57% in adult and young animals, respectively in Helmex-export abattoir and Mesele *et al* (2013) who reported 37.9% and 49% in young and adult animals, respectively in and around Alameta Woreda, Ethiopia. The more infection in young animals might be due to the fact that these animals have greater susceptibility due to lack of previous exposure to the parasite. During the first year of their life, young animals fed, grazed and browse on grasslands, thus the first stage of their exposure to infection with parasites occurs. It was also explained that low level of parasitism reported in the adult animals due to the development of significant immunity with the course of time. Gradually, as the exposure to parasitic infection increases, the immune system of host animals builds up especially against *Haemonchus* species and age resistance develops (Bhat *et al*., 2011; Seth, 2014; Wells, 2005).

With regard to the body condition of the examined small ruminants, the prevalence of the infection was

higher in animals with medium body condition (64.8%) as compared to animals with good body condition (61.5%). These difference was found statistically insignificant (P > 0.05) among animals with different body. This finding was in line with the report of Shankute *et al* (2013) who reported prevalence of 77.21% and 84.44% in animals with medium and good body conditions; and Badaso and Addis (2014) who showed higher prevalence of the parasite in animals with medium body condition (67.3%) than in animals with good body condition (55%)in Arsi Negelle Municipal Abattoir, Ethiopia. Similarly, Fentahun and Luke (2012) indicated that the prevalence of infection was higher in medium body conditioned animals than that of good body conditioned with the prevalence of 81.2% and 73.6%, respectively. Our finding disagreed with the results reported by Ragassa *et al*. (2006) who report prevalence of haemonchosis was found to be higher in good body conditioned than medium body conditioned animals. This could be explained by the fact that loss of body condition in the study animals might be due to other factors, such as seasonal change of forageable feed staff, poor management system and the presence of other concurrent diseases which can lead to poor immunological response to infective stage of the parasites (Seth, 2014 and Taylor *et al*., 2007).

The prevalence of the *H. contortus*was differentin small ruminants that originated from different sites. The prevalence of the haemonchosis was higher in those small ruminants originated from Yebello with the rate of 69.6% followed by those originated from Ginka and Negelle borana with the rates of 59.1% and 55.2%, respectively and there was statistically significant difference($P< 0.05$)in the prevalence of parasite among animals with different origins. This differences could be due to the fact that sheep and goats of the area are managed under extensive management system with high stocking density where large numbers of animals graze together throughout the year in communal grazing land which can lead to more contamination of the pasture by eggs and then increases the number of worms spread on a pasture (Waller, 2005).

CONCLUSION AND RECOMMENDATIONS

Gastrointestinal nematode parasites are the major animal health constraints in small ruminants' production. *H. Contortus* has been ranked as the most important parasite of small ruminants in all regions across the tropics and subtropics and causes an insidious drain on production, weight losses and even mortality in young animals. The current study revealed that prevalence of haemochosis was higher in small ruminants 69.6% and 57.1% in sheep and goats respectively. This might due to fact that, the sheep usually graze very close to the soil which might be helpful in the acquisition of more infective larvae from the contaminated herbage and goats browse on shrubs and small trees where translation of infective larvae to such height seems impossible. The distribution of Haemonchosis was higher in young compare to adult shoats. It was also explained that low level of parasitism reported in the adult animals is due to the development of significant immunity with the course of time. In this finding, there was statistical significance ($p < 0.05$) between species, origin and age groups. The prevalence rate was higher in medium body condition than good body condition. This might be due to poor management system and poor immunological response to infective stage of the parasites.

Based on the above conclusion the following recommendations are forwarded:

- Segregations of small ruminants according to their age group should be practice to reduce the harboring of parasite by young sheep and goats.
- An appropriate strategic control and prevention methods of haemonchosis parasite should be designed in young sheep and goat.
- Decreasing the stocking rate should be applied to decreases the number of worms spread on a pasture.

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