



Prevalence of Haemonchosis in Sheep Slaughtered at Shambu Municipal Abattoir, Oromia, Ethiopia

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ABSTRACT

A cross-sectional study was carried out from April 2018- May 2018 to determine the prevalence of *Haemonchus contortus* in sheep slaughtered at Shambu municipal abattoir, south west Ethiopia. Appropriate procedure was applied for postmortem examination and sample collection. A total of 384 sheep abomasums, collected from randomly selected sheep, were examined on postmortem. The overall prevalence of *H. contortus* was found to be 29.9%. It was noticed that high prevalence was recorded in animals with poor body condition (37.6%), followed by good body condition (23.07%) and the lowest was recorded in animals with medium body condition (22.6%). The occurrence of haemonchosis was more frequently recorded in youngest (less than one year) (28.5%) than in older (above one year) sheep (25.9%) but there was statistically significant difference ($P < 0.05$) observed with the risk factor (age) in relation to the prevalence of *H. contortus*. However, there was no statistically significant difference ($P > 0.05$) observed among the risk factor (body condition) in relation to the prevalence of *H. contortus*.

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1. Introduction

In many countries particularly, small ruminants play a great role in the economy of the country, as sources of meat, milk, fiber, cash income, and skin and they can live in extreme climatic conditions, they can exploit herbage, which is unsuitable for large ruminants, and they require few labor-intensive inputs (Fraser *et al.*, 1991).

Ethiopia lies within the tropical latitudes of Africa and has an extremely diverse topography, wide range of climatic features, and a multitude of agro-ecological zones, which make the country suitable for different agricultural production systems. This in turn has contributed to the existence of a large diversity of farm-animal genetic resources in the country. Ethiopian livestock production systems are broadly characterized as low input, mixed crop-livestock, agro-pastoral, and pastoral systems, as well as medium input, peri-urban, and urban enterprises. These livestock are almost entirely man-aged by the poor smallholder farmers and pastoralists (Sisay *et al.*, 2007).

Generally, sheep are the predominant livestock in area of high lands of 3,500 meters above sea level; sheep assume a great share in socio-economic activities of about 85% of the population. Small holders in the high land area where is mixed crop-livestock population is practiced own most sheep in Ethiopia, these sheep are an integral part of the livestock sector of the economy. Sheep supply meat, wool/hair and skin that generate about 89% of the farmer's cash income (Gryseels *et al.*, 1998).

Other special attributes of sheep over the other livestock resources include that they are highly adaptable to broad ranges of environment, have short generation cycles, and have high reproductive rates which lead to high production

efficiency and poor people can afford few ewes since cost of them is less than a cow. With little inputs, sheep play an important role in the rural economy through provision of meat, milk, cash income, accumulating capital, fulfilling cultural obligations, manure and contribute to the national economy which can be incurred due to the export of live animals, meat, and skins (Tibbo *et al.*, 2003).

Endoparasites are responsible for the death of one-third of calves, lambs, and kids and considerable losses of parts of carcasses condemned during meat inspection. It is well recognized that, in resource poor regions of the world, helminthes infections of sheep and goats are major factors responsible for economic losses through reduction in productivity and increased mortality. Nematode parasites of small ruminants result in low productivity due to stunted growth, poor weight gain, and poor feed utilization (Pedreira *et al.*, 2006).

The principal abomasal worms of sheep are *Haemonchus contortus*, *Ostertagia circumcincta*, *Ostertagia trifurcata*, and *Trichostrongylus axei*. *Haemonchus contortus* is one of the most important abomasal worms of sheep which is known as "red stomach worm" or "wire worm" of small ruminants. It is most prevalent and pathogenic parasite and also economically important disease of sheep. *Haemonchus contortus* is a species most commonly found in sheep and goat but *Haemonchus placei* is the usual species in cattle and even so cross infection may occur when small ruminants and cattle graze together but the infestations are usually of less severity (Radostits *et al.*, 2000).

Although helminthes parasites of ruminant livestock are ubiquitous in all of the agro-climatic zones of Ethiopia with prevailing weather conditions that provide favorable

condition for their survival and development, their presence does not mean that they cause overt disease. Among the diseases that constrain the survival and productivity of sheep, gastrointestinal nematode infection ranks highest on a global index with *Haemonchus contortus* being of overwhelming importance. *Haemonchus contortus* found in abomasum of sheep and goat causes blood loss resulting in decrease in erythrocytes, lymphocytes, hemoglobin, packed cell volume, body weight, and wool growth. The abomasal nematode *Haemonchus contortus*, which is particularly important and causes severe anemia and death in severely infected animals, identified haemonchosis as one of the top ten constraints to sheep and goat rearing in east Africa (Perry et al., 2002).

Haemonchus is one of the important endoparasites of sheep. The first and second stages of larvae are free-living organisms and the host ingests the third stage larvae starting the infection. Adults of the parasite are found on the surface of the mucosa (the lining of the stomach). Both the larvae (L4) and the adults of *Haemonchus* species suck blood. A thousand *Haemonchus* species of adult can suck 50 mL of blood/day causing severe anemia. A heavy *Haemonchus* species infection (20,000–30,000 worms) can kill sheep very quickly. All ages of sheep are susceptible to *Haemonchus* species infection but lambs are more susceptible than adults (Shapiro et al., 2005).

The cardinal sign of haemonchosis is pallor of the skin and mucous membranes. A hematocrit reading of less than 15% is always accompanied by extreme weakness and shortness of breath and warrants a grave prognosis; less of plasma protein results in anasarca frequently manifested externally as a submaxillary edema (bottle jaw). The appetite typically remains good and, in acute outbreaks, affected animals may not lose appreciable weight. Feces are well formed; diarrhea occurring only in infections complicated by the presence of such species as *Trichostrongylus species* and *Cooperia species*. Lambs are the most seriously affected members of the flock, but older sheep under stress also may have fatal anemia (Bowman, 2005).

While, in temperate regions, the severity of gastrointestinal (GI) parasitic disease in most livestock farms is now minimized through the seasonal use of anthelmintics and pasture management, the problem persists in the vast majority of tropical and subtropical regions. Among the gastrointestinal parasites, *Haemonchus contortus* is the species with greatest pathogenic and economic importance in sheep. It is important to assess the type and level of parasitism in ruminant livestock, in order to be able to determine the significance of parasite infection and to recommend the most beneficial and economically acceptable control measures. The determination of the risk factors associated with parasite occurrence can be used to design an effective control strategy (Odoi et al., 2000).

Previously there was not any documented data with regard to the prevalence of the haemonchosis in small ruminants regardless of the high populations of sheep in the study area and most previous studies in Ethiopia were based on coprological examinations. This research work is an attempt to determine the prevalence of ovine haemonchosis based on postmortem examination in shambu municipal abattoir and to assess the influence of host related risk factors in the study area.

2. Materials and Methods

2.1. Study Area

The study will be conducted from November 2018 to December 2018 in Shambu municipal abattoir (Horro Guduru

zone), Horro Guduru Wollega zone is located between 09°29'N and 37°26'E, at an altitude of approximately 2296 m.a.s.l, with a uni-modal rainfall ranging between 1200mm-1800mm. The rainy season occurs from April to mid-October where maximum rain is received in months of June, July and August. Maximum temperature of 23-27°C are reached from January to March, and minimum temperature of 7-15 °C is normal from October to November (CSA, 2013).

2.2 Study Animals

The study animals were 384 sheep in which (232 females and 152 males) slaughtered in shambu municipal abattoir. Animals were indigenous breeds kept under traditional management system. The study animals were sheep of local breed with different sex and body condition brought for slaughter. In addition, the age of the sheep was characterized using teeth eruption by (Vatta et al. 2006) and body condition scoring method as per (ESGPIP, 2007).

2.3 Study Design and Type of Study

A cross-sectional study using simple random sampling technique was conducted from November 2018 to December 2018 to determine the prevalence and associated risk factors of Haemonchosis in sheep slaughtered at the study area.

2.4 Sample Size Determination

To calculate the total sample size, the following parameters were used: 95% of confidence level (CL), 5% desired level of precision; and with the assumption of 50% expected prevalence of haemonchosis among sheep and goats in the study area, the sample size was determined using the formula given by Thrusfield (2005).

$$n = \frac{(1.96)^2 (P_{exp})(1 - P_{exp})}{d^2} \quad (1)$$

Where, n=required sample size; P_{exp}= expected prevalence; d= desired absolute precision. Hence, by using this formula, the sample size was calculated to be 384.

2.5 Study Methodology

The Ante Mortem examination was performed a few hours before slaughtering from randomly selected Sheep. The age, sex, body condition and general health condition of the animals were properly recorded. The animals in the present study were adult and young and there were poor, medium and good body condition animals during study periods since the owners of hotels and restaurants preferred animals with better body condition for slaughter. As the animals were obtained from different markets, it was difficult to know the exact origin of the animals. The bomasums was opened along its greater curvature and close visualization was made for the presence of adult *Haemonchus* parasite. The bomasums's wall was carefully observed for any gross changes including its contents and the adult *H. contortus* worms were identified visually by standard method given by (Urquhart et al. 2003).

2.6 Data Analysis

Computation of descriptive statistics was conducted using SPSS version 20.0. Descriptive statistics such as percentages, proportions and frequency distributions were applied to compute some of the data. 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 (χ^2) to measure association between prevalence of the haemonchosis with the species, age, sexes, body condition and months was used as the statistical tool. Confidence level was held at 95% and statistical analysis for the difference in prevalence of *H. contortus* among risk factors were considered significant when the p-value was less than 0.05 ($P < 0.05$).

3. Results and Discussion

In this study a total of 384 sheep were examined using postmortem for the presence or absence of *H. contortus* and the result revealed that 115 were positive and the overall prevalence of haemonchosis in sheep was found to be 29.9% (115/384) in the study area. Similarly, the prevalence of the parasite in sheep having a different body condition indicated that there is no significance difference of the parasite higher in poor body condition animals with the rate of 37.6% compared to medium body condition sheep having the rate of 23.07% (Table 1).

Table 1. Prevalence of Haemonchus in sheep based on body condition.

Body condition	No. of examined	No. of positive	Prevalence (%)	X ²	P-value
Poor	186	70	37.6	10.165	0.006
Medium	133	30	22.6		
Good	65	15	23.07		
Total	384	115	29.9		

This study reveals, higher prevalence of haemonchosis infection was observed in young animals (41.8%) as compared to adult (16.3%). There was highly statistically significant difference (P = 0.000) between the two ages groups (Table 2).

Table 2. Prevalence of Haemonchus in sheep based on the age group

Age	No. of examined	No. of positive	Prevalence (%)	X ²	P-value
Young	255	94	41.8	17.3	0.006
Adult	129	21	16.3		
Total	384	115	29.9		

In the present study, higher prevalence of haemonchosis infection was observed in male sheep (32.9%) as compared to female (28.01%). There was statistically not significant difference (P=>0.308) between sex groups of sheep (Table 3).

Table 3. Prevalence of Haemonchus in sheep based on the sex

Sex	No. of examined	No. of positive	Prevalence (%)	X ²	P-value
Male	152	50	32.9	1.041	0.308
Female	232	65	28.01		
Total	384	115	29.9		

Sheep is one of the most important animals that provide farmers with food and other products and by products. One of the most noteworthy antagonistic factors to sheep farming is parasitic diseases; especially those caused by nematodes. *H. contortus* is one of the most important endoparasites of sheep that needs greater emphasis (El-Dakhly et al., 2012).

The present study revealed that the overall prevalence of *Haemonchus contortus* in sheep was 29.9%, which indicated a low prevalence of the parasite in the study area. This finding was much lower compared with the study conducted by (Moges et al., 2017) in bahidar who reported prevalence of 40.9%, (Mekonnen and Tibeso, 2015) in Arsi Negelle who reported prevalence of 67.2%, (Lidya et al., 2014) in wukro who reported prevalence of 40.9%, (Tewodros and Girja, 2012) in Gonder who reported prevalence of 80.21% and (Raza et al., 2009) in Multan abattoir who reported prevalence of 37.18%.

Similarly, the current finding is lowered compared to different researchers such as (Bayu, 1992) in Wellega who recorded prevalence of 88.2%, with the rate of 93.6% in the Ogaden region, and 96.5% in Eastern part of Ethiopia (Abebe and Esayas, 2001). Compared to the finding of (Mesele et al., 2014) who reported the prevalence of 26.8% in Abergele

Export Abattoir, the current finding was higher. With regard to the body condition of the examined sheep the rate was higher in poor body condition sheep compared to the medium and good body condition sheep with the prevalence of 37.6%, 22.6% and 23.07%, respectively.

There was no statistical significant variation (P>0.05) in prevalence of *H. contortus* among different body condition scores. Similar results to the present study were reported by (Mesele et al., 2014) and (Gonfa et al., 2013). In this current study, highest infection rate was recorded in animals with poor body condition. This is due to the fact that immune compression due to weight loss that leads to immune system of the animal disturbed at a time the animal's unable to cope up the parasite and other disease by themselves is getting worth.

This result is inconsistent with the previous reports of (Gonfa et al., 2013) who reported prevalence of 77.21% and 84.44% in good and medium body condition animal, respectively. Similarly, (Tewodros and Girja, 2012) indicated that the rate of the parasite was higher in medium body condition sheep compared to that of good body condition with the prevalence of 81.2% and 73.6%, respectively.

The current finding also indicated that there was significant difference of the prevalence of the parasite in young and adult sheep (p=0.000) where it was higher in young sheep compared to adult sheep with the rates of 41.8% and 16.3%, respectively, but (Gonfa et al., 2013) indicated that the prevalence in young and adult sheep was 86.9% and 86.57%, respectively.

Regarding the sex distribution of the parasite, the current finding revealed that the prevalence in male and female sheep was 32.9% and 28.01%, respectively. There was no statistical significant difference in male and female (p>0.05). At the same time, (Tewodros and Girja, 2012) reported that the rate was higher in male with the prevalence of 80.9% compared to female having the rate of 77%. In contrary to the current finding, (Tilaye et al., 2013) reported that the rate of the parasite was higher in male compared to female with the prevalence of 34.11% and 39.22%, respectively. In support of the finding of (Tewodros and Girja, 2012) indicated that the rate of the parasite was higher in female than male with the prevalence of 81.9% and 76.9% respectively.

4. Conclusion

Haemonchus contortus is an important blood sucking parasite of the ovine's and causes loss of production. The result of the present study indicated that *H. contortus* is an important disease in the study area with an observed prevalence of 29.9%. The prevalence of haemonchosis in this study is statistically associated (P<0.05) with age. However, sex and body condition was not statistically significance (P>0.05) with prevalence of haemonchosis. The distribution of the parasite were higher in poor body condition animals (37.6%) than good body condition (23.07%) and medium body condition (22.6%) and males (32.9%) than females' (28.01%) animals, which needs great attention when designing the control programs of the parasite. The occurrence of the parasite among the sheep of the study site might be associated with the level of immunity of the animals as most of the young animals and those medium body conditions having low immune status are affected.

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