Coprological Examination of Haemonchus on Small Ruminant (Study in Janamora Wereda)

Lakech Ewnetu

Dr. Lakech Ewnetu
Animal Health Disease Surveillance Expert in Janamora Wereda Livestock Development Office
Janamora, Ethiopia

Abstract: A cross-sectional study was carried out from December, 2018 to February 2019 to determine the prevalence and associated risk factor of haemonchosis in randomly selected sheep and goat in Janamora Wereda. Fresh faecal samples were collected from 384 randomly selected sheep (n=296) and goats (n=88). The overall prevalence of haemonchus in both species of animals was 53% (204/384). At species level, 55% (164/296) sheep and 45% (40/88) goats were found positive. There was no statistically significant ($\chi^2=3.536, p=0.171$) difference observed between the two species. Similarly, the prevalence of haemonchus infection in related with age were 62% animals <2 years, 58% which was included in 2-4 years and 41% animals >4 years old. Moreover, there was a statistically significant ($\chi^2=13.198, p=0.001$) difference observed among the three age categories while there was statistically insignificant ($\chi^2=2.31, p=0.128$) difference in males 48% (74/153) and in females 56% (130/231). In addition, the prevalence of haemonchosis in poor body condition was high (58%) in relative to good (48%) and medium (53%) in the study area. However, there was no statistically significant ($\chi^2=2.43, p=0.297$) variation observed. Furthermore, concerning the relationship between place of origin and haemonchosis were statistically significant ($\chi^2=6.88, p=0.033$) and the prevalence of During the study period, the highest prevalence of haemonchosis was recorded in those animals brought from Deresgie (62%); while the lowest prevalence was recorded in the animals that brought from Enchet Kab (49%) and Denkolako (48%). This might be due to the environmental factors such as temperature and humidity that facilitates the distribution of the parasite to the grazing pasture because of the geographical area which is easy predisposing with flood especially during the rainy season. This study showed the occurrence of infection of small ruminants of the area by abomasal nematodes suggesting the existence of pasture contamination and the availability of infective larvae during months of the study period.

Keywords: Janamora, Enchet Kab, Denkolako, Deresgie, Goat, Haemonchus & Sheep.

1. INTRODUCTION
Sheep and goats, requiring little inputs, play vital role in rural economy through provision of meat, milk, blood, cash income, accumulating capital, fulfilling cultural obligations, manure, and contribute to the national economy through the export of live animals, meat and skins[1]. Helminth infections in domestic ruminants are major importance in many agro-ecological zones in Ethiopia and had the highest
index as an animal health constraint to the poor keepers of livestock worldwide through losses due to reduced weight gains and growth rate, reduced nutrient utilization, lower meat, wool and milk production, involuntary culling, cost of treatment and mortality [2]. Gastrointestinal nematodes are recognized as a major constraint to both small and large-scale small ruminant production in developing countries, leading to significant economic losses [3]. The abomasal nematode Haemonchus contortus is particularly important and causes severe anaemia and death in severely infected animals Review of the available literature in Ethiopia strongly suggests that helminthosis has nationwide distribution and is also considered as one of the major setbacks to livestock productivity incurring huge indirect and direct losses in the country [4].

In rural and semi-rural regions livestock represent the pillar of the economy and plays a vital role in livelihood of the farming communities [5]. Of the endo-parasites, the abomasal nematode H. contortus is incriminated as the dominant cause of parasitic gastroenteritis and exerts a severe economic toll in sheep and goats [6]. The severity of the disease depends on a variety of factors, including the number of helminthes infecting an animal intensity of the infection.

Several factors are involved in the pathogenesis of haemonchosis. In terms of the development of disease, the most important factors are parasite virulence and host response. The main pathogenic mechanisms of H. Contortus are a direct lesion on the gastric mucosa and haematophagy. Ovine haemonchosis occurs in three forms: peracute, acute, and chronic. The per acute form is less common and the infected lambs may die suddenly from severe haemorrhagic gastritis. Lambs and young sheep are commonly affected by the acute form of the disease in which animals are found dead without showing over clinical signs [7]. The prevalence of gastrointestinal nematodes (GIN) in tropical and subtropical areas has adversely affected the production potential of sheep leading to countless deaths and insidious economic losses in livestock sector. Among (GIN), H. Contortus is considered the main culprit causing anaemia and hypoproteinaemia in ruminants [8]. Even though the economic significances and prevalence of haemonchus is high there was no previously reported and documented study in the study area. Therefore, the major objectives of this study were:

- To determine the prevalence of small ruminant haemonchosis in Janamora Wereda.
- To assess the associated risk factors of small ruminant haemonchosis in the study area

2. MATERIALS AND METHODS

2.1. Study area

Janamora Wereda is located in North Gondar Zone of Amhara region, at the latitude and longitude of 12°59'N 38°07'E at a distance of about 180km from Gondar town. Janamora Wereda is well-known with Semien mountain National Park, Ras Dashen i.e the highest point in Ethiopia and it is a home to a number of endangered species including the Ethiopian Wolf, waliya ibex, and a wild goat which no found in elsewhere in the world. The area has an altitude range of 2900 meters above sea level. The region is marked by numerous mountains, hilly, and sloppy areas, plateaus, rivers, and many streams. Livestock population of the area comprises 100,386 cattle, 32,975 sheep, 131,041 goats, 2,540 horses, 634 mules, 7758 donkeys, 119,347 poultry. The farming system of the study area is characterized by a mixed crop-livestock production system. Transhumance, from the highlands to western lowlands, is practiced as an important strategy to secure grazing resources for the highland livestock during the dry season of the year. In the case of the lowlands, crop farming is not as intensive as high and mid-highland areas and livestock has larger contributions to the farmer’s livelihoods [2]. The study animals are small ruminant which is found in Janamora Wereda kebeles such as Deresige, Enchet Kab and Denkolako Kebeles.

2.2. Study population

The study animals were sheep and goats with different age, sex and body condition. The origins of these animals were from three randomly selected kebeles of Janamora Wereda. A total of 384 animals of sheep (n=296) and goats (n=88) were randomly selected and examined. The ages of animals were
determined using owners' information and dentition (Gatenby). Accordingly, animals were categorized as young (< 2 years) and 2-4 and adults (> 4 years) [9] And the body condition of animals were grouped as good, medium and poor [10].

2.3. Study design:
A cross-sectional study design was used to estimate the prevalence of haemonchus infection in sheep and goats in the study area. A simple random sampling technique was used to select kebeles and study animals. The sample size was determined using the formula given by Thrusfield [11] with 50% expected prevalence, a 5% desired absolute precision and 95% confidence interval.

2.4. Sampling and Coprological examination:
A total of 384 faecal samples were collected directly from the rectum of each study animal using disposable glove. The collected samples were properly labeled with the necessary information and transported to the respective veterinary clinic immediately. The floatation technique was employed to concentrate parasite eggs in the faeces and examined microscopically for presence of haemonchus eggs on the basis of their morphology [12].

2.5. Sample size determination
The desired sample size was calculated using the standard formula described by Thrusfield [11] Since there was no previous work done on this area, the expected prevalence is 50%, the minimum sample size at 95% confidence interval and at 5% precision or accuracy level the sample size is calculated to be 384 using the formula.

\[ n = \frac{1.96^2 \cdot P_{exp} \cdot (1 - P_{exp})}{d^2} \]

Where; n: required sample size
Pexp: expected prevalence
d: desired absolute precision [9].

2.6. Data management and analysis
The data was checked, coded and entered into Microsoft excel work sheet and analyzed using SPSS software version 16.0. Descriptive statistics was used to express prevalence while chi-square $\chi^2$- test was used to compare as haemonchus prevalence rate with sex, age, body condition, species as well as place of origin.

3. RESULT
Out of the total numbers of 384 sheep and goats examined, 204 were infected and the overall prevalence of haemonchosis were 53% (204/384). The infection rates of haemonchosis in female and male small ruminants were 48% (74/153) and 56% (130/231) respectively, which reveals as there is no significant difference observed ($\chi^2$=313, p=0.128). In addition, among 296 sheep examined, the infection rate was 55% (164/296) whereas, in goats the infection rate was 45% (40/88) from the total numbers of 88 goats examined (table2).

Even though there was high infection rate recorded in sheep (55%), the infection rate was no statistically significant ($\chi^2$=3.53, p=0.171) difference observed. On the other hand, the prevalence of haemonchosis in different body conditioned animals were 53%, 58% and 48% in medium, poor and good body conditioned animals respectively. However, there was statistically insignificant ($\chi^2$=2.43, p=0.297) difference observed among the three body condition categories. The occurrence of haemonchosis was also more frequently recorded in those animals <2 years and 2-4 years, and their prevalence rate was 62% and 58%, respectively than those animals which are >4 years and prevalence rate of 41%. Moreover, there was significant difference ($\chi^2$=13.198, p=0.001) observed in the three age groups (table3).
Concerning on the prevalence of haemonchosis in different places of origin, there was high rate of infection in Deresigie (62%) in relative to Enchet Kab (49%) and Denolako (48%), (table 5). The infection rates of small ruminant species was statistically significant in relation to place of origin ($\chi^2=6.88$, $p=0.033$).

Table 1: Prevalence of haemonchosis based on sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>No of positive</th>
<th>No of negative</th>
<th>Total</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>130</td>
<td>101</td>
<td>231</td>
<td>56%</td>
</tr>
<tr>
<td>Male</td>
<td>74</td>
<td>79</td>
<td>153</td>
<td>48%</td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>180</td>
<td>384</td>
<td>53%</td>
</tr>
</tbody>
</table>

$\chi^2=2.313$, $p=0.128$

Table 2: The Prevalence of haemonchosis in relation to species

<table>
<thead>
<tr>
<th>Species</th>
<th>No of positive</th>
<th>No of negative</th>
<th>Total</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep</td>
<td>164</td>
<td>132</td>
<td>296</td>
<td>55%</td>
</tr>
<tr>
<td>Goat</td>
<td>40</td>
<td>48</td>
<td>88</td>
<td>45%</td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>180</td>
<td>384</td>
<td>53%</td>
</tr>
</tbody>
</table>

$\chi^2=3.536$, $P=0.171$

Table 3: The Prevalence of haemonchosis based on age category

<table>
<thead>
<tr>
<th>Age</th>
<th>No of positive</th>
<th>No of negative</th>
<th>Total</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2</td>
<td>81</td>
<td>50</td>
<td>131</td>
<td>62%</td>
</tr>
<tr>
<td>2-4</td>
<td>63</td>
<td>45</td>
<td>108</td>
<td>58%</td>
</tr>
<tr>
<td>&gt;4</td>
<td>60</td>
<td>85</td>
<td>145</td>
<td>41%</td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>180</td>
<td>384</td>
<td>53%</td>
</tr>
</tbody>
</table>

$\chi^2=13.198$, $p=0.001$

Table 4: The Prevalence of haemonchosis based on body condition

<table>
<thead>
<tr>
<th>Body condition</th>
<th>No of positive</th>
<th>No of negative</th>
<th>Total</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>50</td>
<td>55</td>
<td>105</td>
<td>48%</td>
</tr>
<tr>
<td>Medium</td>
<td>70</td>
<td>63</td>
<td>133</td>
<td>53%</td>
</tr>
<tr>
<td>Poor</td>
<td>84</td>
<td>62</td>
<td>146</td>
<td>58%</td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>180</td>
<td>384</td>
<td>53%</td>
</tr>
</tbody>
</table>

Table 5: The Prevalence of haemonchosis in relation to place of origin

<table>
<thead>
<tr>
<th>Place/Origin</th>
<th>No of positive</th>
<th>No of negative</th>
<th>Total</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enchet Kab</td>
<td>47</td>
<td>49</td>
<td>96</td>
<td>49%</td>
</tr>
<tr>
<td>Denkolako</td>
<td>64</td>
<td>68</td>
<td>132</td>
<td>48%</td>
</tr>
<tr>
<td>Deresigie</td>
<td>97</td>
<td>59</td>
<td>156</td>
<td>62%</td>
</tr>
<tr>
<td>Total</td>
<td>204</td>
<td>180</td>
<td>384</td>
<td>53%</td>
</tr>
</tbody>
</table>

$\chi^2=6.88$, $p=0.033$
3. DISCUSSION

The study was conducted from December, 2018 to February 2019 in Janamora Wereda to examine the prevalence rates and associated risk factors of haemonchosis in small ruminants. The overall prevalence of haemonchus parasites in the 296 sheep and 88 goats were 53%, with 45% (40/88) in goats and 55% (164/296) in sheep across the three different locations. There was no statistically significance difference (P>0.05) between the two small ruminant species; this reveals that they are equally susceptible to haemonchosis. In goats the prevalence of haemonchosis was higher in males compared to females, while in sheep the opposite was observed. Normally, females are assumed to be more heavily infested due to hormonal differences and stress during pregnancy. In goats the present results may be due to the stall feeding of female animals during pregnancy, which reduces exposure to pasture contamination [13, 14].

The overall infection rate of haemonchosis (53%) in the present study area was lower than the previous studies conducted in different areas of Ethiopia. For example, in East shoa Melikamu [15] reported 96.43% prevalence in sheep and 94.52% in goats, Esayas [16] and Bersisa [17] reported 95.6% and 90.78% in sheep and 100% and 96.55% in goat in Eastern Ethiopia, Bayou in Wollega recorded prevalence of 88.2%, Solomon 93.6 % in the Ogaden region, Wossene 91.2% in sheep and 82.9% in goats of Ogaden region. This variation in prevalence of haemonchosis in small ruminants may be due to the differences in agro-ecology, management practices, season, sample size, services of veterinary infrastructure, seasonal de-worming, increment the awareness of people attention to the animal and genetic improving of the animal.

The present study noted that prevalence was higher in animals less and equal to two years than above four years old. These results are closely related to the findings of Assoku, [18] and Lateef[19]. The effect of age on faecal egg counts was highly significant (P<0.01). Maqsood [13] reported that the prevalence of haemonchosis was higher in both sheep and goats less than two years of age (67.1%; 47.8%) compared with those of above four years (40.4%; 33.3%). (Tariq [20] and Zeryehun, [21] reported that older animals recover from parasitic infection more quickly as the immunity of the host increases with age; animals may hence become immune, especially as they undergo repeated exposure [22]. It was recognized that sheep below or equal to two years of age are more susceptible to parasite infection than above four years of age [23, 24]. This may be due to the fact that with the advancement of age, vigor of the animal becomes better and they develop resistance against the parasitic diseases [25]. The overall prevalence of 53% reflects the importance of these blood sucking parasites in Janamora. This is still very low compared to the prevalence reported in other countries: 82% in Togo [26] 94% in Middle Guinea [27] and 60% in Eastern Ethiopia [28]. Lower prevalence has also been reported elsewhere [20, 22, 25].

The results of the present study was in line with 55% in sheep and 45% in goats and this report indicates how much the parasite is highly significance in case of prevalence, pathogenesis, its biotic potential, ability of anthelmintic resistance, unique survival strategy due to considerable biological and ecological plasticity (Hypobiosis and self-cure phenomena) and economically most important nematode with the ability of causing losses in most classes of animals. In general it is the most economically important nematode in the study area with the ability of causing effect on the health as well as the productivity of small ruminants, in addition to these the parasite has developed resistance for commonly used antihelmenthics and cause challenges for small ruminant rearing.

Presence of sufficient rainfall and moisture areas favored the survival of infective larvae in pasture and higher probability of uptake of the infective larvae leading to higher prevalence rate. Relationship between body condition poor (58%), medium (53%) and good (48%), and haemonchosis in sheep and goats was recorded and no statistical difference between medium, poor and good body conditioned animals which means all animals that have been different body conditioned were equally susceptible for haemonchosis which agrees with Regassa [29].

However, it disagrees with previous reports by Tasawar [30]. This could be explained by the fact that loss of body condition in the study animals could be due to other factors, such as seasonal change of forageable feed staff and the presence of other concurrent diseases.
During the study period, the highest prevalence of haemonchosis was recorded in those animals brought from Deresgie (62%); while the lowest prevalence was recorded in the animals that brought from Enchet Kab (49%) and Denkolako (48%). This might be due to the environmental factors such as temperature and humidity that facilitates the distribution of the parasite to the grazing pasture because of the geographical area which is easy predisposing with flood especially during the rainy season. This study showed the occurrence of infection of small ruminants of the area by abomasal nematodes suggesting the existence of pasture contamination and the availability of infective larvae during months of the study period.

4. CONCLUSION AND RECOMMENDATION

The results of the current study indicated that haemonchosis is a prevalent disease in study area and is an important health problem of the sheep and goats which are speculated to cause heavy economic losses through low performance and short life expectancy of working small ruminant.

These nematode parasites are more prevalent and familiar helminthes in the study area and have significance role in the life system of developing countries especially in Africa, particularly for consumption as well as exportation.

- Based on the above conclusion the following recommendations were forwarded:
  - Commercially available anthelmintics should be used according to deworming schedule.
  - Well organized parasitic control measure and management system should be employed.
  - Education and awareness creation of community with regards of economic significances and epidemiology of haemonchosis on small ruminants should be given special attention.
  - Use of isolated grazing system for different age group as well as host species, and use of rotational grazing system as in case of haemonchus control should be applied.
  - Pasture and herd management practices should be improved.
  - Pasteur the pasture grazing with a short duration crop such as alfalfa in order to break the life cycle of H. contortus.
  - Provide high nutrition diet to pregnant sheep and goats which will boost up their immune response against parasites.

5. REFERENCES