Study on the Prevalence of Ovine Haemonchosis and its Associated Risk Factors at Debre Birhan Municipal Abattoir, North Shoa, Ethiopia

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Abstract: A cross-sectional study was conducted to determine the prevalence of Haemonchosis at Debre Birhan municipal abattoir of North Shoa zone of Amhara Regional State from November 2011 to March 2012. A total of 384 abomasums of sheep were selected and taken with simple random sampling and examined according to standard procedures. Data cleaning was conducted on the collected row data within excel. OpenEpi and SPSS V.20 were used for statistical analysis. The overall prevalence recorded in this study was 41% (158 of 384). The infection rate was highly significant on body condition, origin of animal (lowland or highland) ($P = 0.000$). While, the observed value was not statistically significant across age and sex ($P = 0.223$, $P = 0.182$). The result of current study indicated as there is very significant value on the bases animals body condition and color of conjunctival mucus membrane basis ($P = 0.000$, $P = 0.000$). Ovine Haemonchosis with its wide distribution has become a very important production constraint especially in the study area where sheep production is common. Body condition, origin, mucus membrane had significance difference on the Haemonchosi, while age and sex did not have significant result. So proper control measure of the disease should be implemented.

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1. Introduction

Livestock largely improves the agricultural sector of Ethiopia both as means of draught power for crop agronomy and feed income generation (MOI, 2005). Especially small ruminants play a role in the economy of one country by providing extra income and support survival to poor resource farmers (Lateef *et al*., 2005) Ethiopia with its great variation in climate and topography possesses one of the largest livestock populations in the world, which is managed by small holder farmer under extensive low input traditional management system and adjunct to crop production. The latest estimate gives 34 million cattle, 24 million sheep, 18 million goats, more than 8 million equines and 59 million poultry (ILCA, 1993)

Although Ethiopia possess the highest number of livestock population in Africa, the productivity of this livestock is generally lower than the Africa average (CSA, 2004). Traditionally sheep and goats have served as a means of ready cash and a reserve against economic and agricultural production hardship. However, the proximity of Ethiopia to large middle Eastern markets demanding export quality sheep and goat carcass which in turn leads to a change in the importance and scale of sheep production (Alemu, 2008). Sheep and goat requiring little inputs play vital role in rural economy such as accumulating capital, fulfilling cultural obligations, manure and contribute to the national economy through the export of live animals, meat and skins. Small ruminants can also be integrated in to the overall production system absorbing surplus labor and consuming small amount of investment (ILCA, 1993).

The importance of small ruminant which produce item of great demand like mutton, wool and hors can never be ignored [6]. But these huge benefits hindered due to infection of parasite diseases, traditional management system and inferior genetic makeup coupled with under-nutrition and complicated by malnutrition and absence of well-developed market infrastructure (Alemu, 2008). Most livestock parasites are known to cause significant morbidity and mortality worldwide, particularly in developing countries (Oyebamiji, 2018). The natural environment healthy individuals co-exist with diseased ones and in most parasitic infections host may not be killed unless the parasitic burden is high. But usually, growth rate and market value of the animal may be reduced while infection may also be of public health importance (Inyang-Etoh *et al.,* 2018). Aniema, 2 George, Ubong. Regards public health concerns, it is necessary to identify disease reservoirs in order to have adequate

knowledge of the transmission mechanism. The prevalence of gastrointestinal nematodes in tropical and subtropical area has adversely affected the production potential of sheep and goats, leading to countless death and insidious economic losses in livestock sector. Besides to this, production of small ruminant's industry can be affected significantly due to high prevalence of *H. contortus* (Lateef *et al.,* 2008). These parasites are common blood feeders that cause anemia and reduced productivity and can lead to death in heavily infected animals (Githigia *et al.,* 2001). Cost effective treatment and sustainable control program of helmenthiasis through knowledge of the species of parasites present, the flock structure, grazing management and seasonal availability of parasite and weather condition in particular area is essential (Hansen and Perry, 1994). Therefore, the objectives of this study were: to estimate the prevalence of ovine haemonchosis at Debre Birhan Municipal abattoir based on post mortem examination, to asses' important risk factors associated with ovine haemonchosis, and to forward better control strategies for ovine haemonchosis.

2. Material and Methods

2.1. Study area

A cross-sectional study was conducted to determine the prevalence of ovine haemonchosis using abattoir survey in Amhara regional state, Norht Shoa zone, Debre Birhan town from November 2011 to March 2012. Debre Birhan town is located at a distance of about 130km from Addis Ababa. The altitude of the area is 2780 meter above sea level. The study area experiences a bimodal rain fall pattern with an average annual rain fall of 954mm. The recorded temperature in the area ranges from 1.3^{o}c to 16.3 ^{o}c. The area has an average humidity of 59.5%. The farming system is mixed type (Crop-Livestock production) (Kifle, 2011). There are large livestock population sizes in the area in which 148,933 local and 14,625 cross breed Cattle, Sheep (133,472), Goats (47,970), Horses (8831), Mules (1478), Donkey (28,709) and Poultry (329, 451). The natural grazing land includes water logged area, forest margin, hill tops, mountainsides, stony land and road sides (CSA, 2009).

2.2. Study Animals

The study animals were 384 sheep (129 males and 255 female) slaughtered at Debre Birhan municipal abattoir. Animals were indigenous breeds kept under traditional management system. The study included young's, adults and old sheep slaughtered in the abattoir. The origin of animals was recorded in the market.

2.3. Study Deign

A cross-sectional study was conducted to determine the prevalence of ovine haemonchosis using post mortem examination in the abattoir. The sampled animals were selected using simple random sampling techniques. The desired sample size was calculated using the standard formula described by (Thrustfield, 2005). Since there was no previous work done in this area, 50% prevalence was taken and the sample was calculated by using the following formula.

$$n = \frac{1.96^2(P)(1-P)}{d^2}$$

where
n = sample size
P = expected prevalence
d = desired level of precision

Therefore, using 50% expected prevalence and 5% absolute precision at 95% confidence level; the number of animals needed in this study was calculated to be 384.

2.4. Sample Collection

Three hundred eighty-four abomasums of sheep were collected and examined for the presence of adult H. contortus. Abomasums were collected as soon as possible usually within 20-30 minutes of evisceration. They were legated at both ends to avoid leakage of abomasal contents. The date of collection, sex, origin, age, body condition, and color of mucus membrane of sample animals were recorded. Then after each abomasums was opened along the major curvature and the content of each were placed in a separate bucket. Each abomasums was then lightly washed in water and the washings added to the contents and passed through a sieve of 200 µm mesh in order to clear the suspensions and retain the adult H. contortus. Examination of the collected sediment was firstly carried out with eye for gathering Haemonchus contortus using some thumb forceps. Finally, samples were examined for further identification of H. contortus. Worm collection and identification were made according to the procedure and techniques described (Hansen and Perry, 1994).

2.5. Data Analysis

Data cleaning was conducted on the kept and managed raw data within Excel Spread Sheet Microsoft (V.16), and descriptive statistics were used for analysis. Comparison of positivity of parasitism was done by chi-square test. Statistical analysis was done using SPSS (V.20) version software, and OpenEpi (V. 2.3) used for further analysis. The explanatory variables (sex, age, and origin) were considered as risk factors to see their association with the level of prevalence of H. contortus. The

significance level was determined at P < 0.05 for all statistically analyzed tests.

3. Results

Out of the total 384 sheep slaughtered, 158 were positive for *H. contortus*. The overall prevalence of *H. contortus* in the study area was 41%. According to sex basis the prevalence of *H. contortus* was 36.4% (47 of 129) and 43.5% (111 of 255) in male and female sheep respectively. There was no statistically significance difference in the prevalence of *H. contortus* between sex ($X^2 = 1.281$, $P = 0.182$) (Table 1).

According to age the highest prevalence which is 46.4% (64 of 138) was observed in young while the lowest prevalence which is 35.9% (46 of 128) was observed in adults. The prevalence of *H. contortus* in older animals was 40.7% (48 of 118). However, there was no statistically significance among age groups ($X^2 = 3.004$, $P = 0.223$).

The prevalence of *H. contortus* in this study was 65.5% (115 of 175) in animals that come from lowland area and 20.6% (43 of 209) in animals which came from highlands. There is highly statistically significant difference ($X^2 = 80.14$, $P = 0.000$) on the prevalence of *H. contortus* on the basis of the origin of animals (Lowland sheep were more affected than highland sheep) (Table 1).

Table 1. Prevalence of Ovine Haemonchosis on Sex, Age and Origin of Animal Basis at Post Mortem, Debre Berhan, Ethiopia, 2011-2012.

Risk Factors	Animals Character	No of Animals Examined	No. positive	X^2	*P*. Values
Sex	Male	129	47 (36.4%)	1.281	0.1823
	Female	255	111 (43.5%)		
Age	Young	138	64 (46.4%)	3.004	0.2227
	Adult	128	46 (35.9%)		
	Old	118	48 (40.7%)		
Origin	Lowland	175	115 (65.5%)		
	Highland	209	43 (20.6%)	80.14	0.000001
	Total	384	158 (41%)		

The prevalence of *H. contortus* on the basis of body condition of the animal was 61.8% (55 0f 89) 34.6% (47 of 136), 35.2% (55 of 159) in poor, medium and good body condition animals, respectively. There is highly statistically significance difference of the prevalence of Haemonchosis across the body conditions considered in this study ($X^2 = 20.42$, $P = 0.000$) (Table 2).

On the basis of the color of conjunctival mucus membrane at ante-mortem examination, the prevalence of *H. contortus* was 59.9% (100 of 167) in animals that have pale conjunctival mucus membrane and 26.7% (58 of 217) in animals that have normal mucus membrane. There is highly statistically significance difference on the prevalence of *H. contortus* on the basis of color of conjunctival mucus membrane ($X^2 = 42.83$, $P = 0.00$) (Table 2).

Table 2: The Prevalence of Ovine Haemonchosis on the Basis of Body Condition and Color of Mucus Membrane of Sheep at Postmortem Examination, Debre Berhan, Ethiopia, 2011/2012.

	Variables	**No. of Animals Examined**	**No. Positive**	**X^2**	***P*. Value**
Body condition	Poor	89	55 (61.8%)		
	Medium	136	47 (34.6%)	20.42	0.000036
	Good	159	56 (35.2%)		
Mucus membrane	Pale	167	100 (59.9%)		
	Normal	217	58 (26.7%)	42.83	0.0000001
	Total	384	158 (41%)		

4. Discussion

Haemonchus contortus is an important and common nematode parasite and requires special attention for its control. It has been suggested that Haemonchus parasite can acquire resistance faster than other gastrointestinal nematodes, like Trichostrongylus because of its high biotic potential (Kassia, 1999). During the study period a total of 384 sheep abomasums were visually examined for the presence of the parasite and an overall prevalence of 41% (158 of 384) was recorded. This finding is lower than similar study done by (Alemu. and Merkel, 2008) who reported an overall prevalence of 78.1% at Bishoftu (Debre-Zeit) town. The reason for the lower

prevalence of the disease in this study area could be the unfavorable environmental condition of the area for the survival of the parasite. Relatively old studies showed that higher prevalence of the disease in different parts of Ethiopia. Reported an overall prevalence of 95.6% and 90.8% in eastern Ethiopia, while reported 100% overall prevalence in Wolaita-Sodo.

The prevalence of *H.contortus* is also reported by different researchers from different parts of the world (Khan, 1993). reported 50-76% prevalence of *H.contortus* in sheep in Rawalpindi, Pakistan. (Iqbal, 1993) reported 21.7% prevalence of haemonchosis in sheep in Faisalabad, Pakistan (Sajid, 1999) reported 68% prevalence of *H.contortus* in sheep from different areas of Faisalabad, Pakistan (Elazary, 1995) reported a prevalence of *H.contortus* 47.9% from Jeddah, Saudi Arabia.

The differences in prevalence reported by these studies could be accounted on the basis of differential management practices (Lindqvist *et al*., 2001, Barger, 1999), natural resistance (Pal, and Qayyum, 1992, Soulsby, 2005, Chaudhary, 2007), drug treatment (Ali, 1997, Barnes, 2001) and local geo-climatic factors (Soulsby, 2005) and nutrition (Datta, 1999).

The present study was conducted by considering age, sex and origin of the animal as risk factors and also the relation between animal status and clinical signs (color of mucus membrane and body condition of animals at ante mortem examination) with the presence of *H.contortus*. However, there was no statistically significance difference (P = 0.182) between risk factors (age and sex) and the presence of the parasite. Even if there was no significance difference between age groups in prevalence of Haemonchosis, younger animals were more affected than adults and olds that is 46.4%, 35.9%, and 40.75% in young's, adults and olds, respectively. This variance in prevalence might be due to immune status and less resistance of younger animals (Elazary, 1995).

Though the variation was statistically significance (P = 0.182), relatively higher prevalence of haemonchosis was recorded in females than males which is 43.55% and 36.4%, respectively. This relatively higher prevalence in females might be attributed to the fact that females frequently exposed to different stressors, like pregnancy, lactation and others [26]. This result is in-agreement with the result of most researchers (PaL,1992, Iqbal, 1993)] who reported that the rate of infection was higher in females than males.

In lowland sheep the prevalence was higher than highland sheep the variation was highly statically significant (P = 0.000). Similar result was reported by (Soulsby, 2005) both of which reported the prevalence of the disease in lowland areas. This result is also supported by scientific facts of the disease. Because scientifically haemonchosis is a disease most frequently encountered in warm climatic areas that favored the life cycle of the parasite (Urquhart, 1996)].

As the present study showed that there was statistically significance association (P = 0.000) among animal status or clinical signs (body condition and color of mucus membrane at ante mortem examination) that is poor body condition animals have highest prevalence (61.8%) followed by almost equal prevalence (35%) of both medium and good body condition animals. There was also highly statistically significance difference (P = 0.000) in relation of color of mucus membrane at ante mortem examination and the prevalence of haemonchosis. In animals that have pale mucus membrane at ante mortem examination, the prevalence was 59.8% where as in normal mucus membrane animal the prevalence was 26.7%. this high variation of the prevalence of haemonchosis in two colors of mucus membrane (normal and pale) at ante mortem examination confirm the pathogenic effect of *H.contortus* that is blood sucker and resulting anemia (pale mucus membrane, bottle jaw and anasarca) (Radostitis, 2007).

5. Conclusion and Recommendation

The present study revealed a moderate prevalence of ovine haemonchosis in the study area. In addition, the study also showed that all age groups and both sexes of sheep were infected equally without any significance difference. This indicates that haemonchosis is not sex and age dependent in the study setting. This disease with its wide distribution has become a very important production constraint especially in the study area where sheep production is common. Haemonchus parasite species are known to cause considerable damage to the host. This parasite is common blood sucker that cause anemia and reduced productivity and can lead to death in heavily infected animals. So, appropriate effort should be made towards the control of haemonchus infection. There for, by taking the fore going facts, the following recommendations are forwarded; Strategic deworming of anthelmintic should be applied at a regular basis, To reduce the pathogenic effect of the parasite and cost of anthelmentics treatment, alternating way of controlling the disease such as rotational grazing and rearing resistant breeds of sheep should be practiced, Creation of awareness among the livestock owners about the pathogenic effect of the parasite and prevention method should be conducted, the epidemiology of the disease needs further study to formulate better control strategies.

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