Approaches in Poultry, Dairy & Veterinary Sciences
CRIMSON PUBLISHERS
Wings to the Research
ISSN: 2576-9162
Research Article

Prevalence of Ovine Fasciolosis in Debre Berhan Agricultural Research Center, North Shewa Zone, Ethiopia

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Submission: January 16, 2019; **Published:** February 28, 2019

Abstract

This study was conducted in Debre Berhan Agricultural Research Center (DBARC) to estimate the prevalence of ovine fasciolosis, and to assess the associated risk factors for the disease. Sedimentation technique was employed to detect fasciola eggs during the study period. A total of 121 faecal samples were examined, in which 85(70.2%) were found to be positive for fasciolosis. Breed wise study was conducted and 57.6%, 35.3%, and 7.1% prevalence's were recorded for Local, Cross and Exotic sheep breeds, respectively. The difference in the prevalence of the disease among breeds was statistically significant (X^2=32.277; df=2; p=0.000). The prevalence of ovine fasciolosis within each breed were 83.33%, 87.5%, 23.92%, 24%, and 66.67% in Menze, Local X Awasi, Local X Dorper, pure Dorper and Washera, respectively. From local sheep, the prevalence was high in Menz (83.33%) compared to Washera (66.67%). Out of cross breed sheep, the prevalence was higher in Local X Awasi (87.5%) when compared to Local X Dorper (23.92%). The lowest prevalence (24%) was recorded in Exotic breed (Dorper). In general, the study indicated that ovine fasciolosis was widely distributed with high prevalence in the study area. At the end, we recommended that appropriate control strategies should be implemented to reduce the impact of fasciolosis on sheep production in the study area..

Keywords: Debre Berhan agricultural research center; Fasciolosis; Ovine; Prevalence; Sedimentation

Introduction

Ethiopia has large number of ruminants including 59.5 million cattle, 30.70 million sheep, and 30.20 million goat populations [1] having high contribution for meat consumption and generates income from export of live animals, meat, edible organs and skin. However, many factors affected the maximum benefit to be obtained from livestock production [2]. In spite of the presence of huge number of ruminant populations, Ethiopia failed to optimally exploit these resources due to a number of factors such as drought, infrastructure problem, different animal disease, shortage of feed, poor management practice, shortage of skilled man power and lack of governmental policies for disease prevention and control [3].

Among the animal disease fasciolosis (liver fluke) is one of the most common economically important parasitic disease of domestic livestock, in particular cattle, sheep, goat and occasionally man. The disease is the major cause for the considerable economic losses in cattle industry, mainly through mortality, liver condemnation, reduces production of milk, meat and expenditure for anthelmintic [4]. The disease is caused by digenean trematodes of the genus *fasciola*, commonly known as liver flukes. The two species most commonly implicated, as the etiological agents of fasciolosis, are *fasciola hepatica* and *fasciola gigantica*. It is a serious disease of grazing animals [5].

Ovine fasciolosis in Ethiopia is very frequent and causes a significant economic loss in production, decrease productivity and loss of body condition and the annual losses were estimated at 48.4 million Ethiopian birr per year, of which 46.5% 48.8% and 4.7% were due to mortality, productivity (weight loss and reproductive wastage) and liver condemnation at slaughter respectively [6].

Benefit from sheep and goat production in Ethiopia remains marginal due to impact of prevalent disease, malnutrition and management constraint, parasitism including fasciolosis represents the major barrier determining the development of sub sector [7]. fasciolosis is a disease mainly of domestic ruminants and occasionally other domestic animal and man caused by liver fluke, parasites, *Fasciola hepatica* and *Fasciola gigantica*. It is particularly important in cattle and sheep [8]. Loss due to fasciolosis is associated with mortality, reduced growth rate, reduction in weight gain and unthriftiness, reduction in working power, condemnation

in large number of infected livers, increased susceptibility to secondary infection and expense due to control measure [6].

The geographic distribution of *Fasciola* species is dependent on the distribution of suitable species of snails such as *Lymnae natalensis* and *Lymnae truncatula*, the most common intermediate hosts 'and usually associated with herds and flocks grazing wet marshy land area. Both *Lymnae* species are needed for the parasites life cycle to be completed. According to Piedrafita et al. [9], the distribution of fasciolosis is associated with the favourable climatic and ecological conditions for development, spread and maturity of parasite and its lifecycle stages in various areas. In view of the worldwide spread occurrence and zoonotic nature, fasciolosis has emerged as a major global and regional concern affecting all domestic animals and infection is most prevalent in regions with intensive cattle production [10]. From the many parasitic problems of farm domestic animals, fasciolosis is the most important disease, which causes direct and indirect economic loss on livestock production, particularly of sheep and cattle [11].

The disease is found in more water lodged and marshy grazing filed condition anticipated to be ideal for the propagation and maintenance of high prevalence of fasciolosis. In Ethiopia, the highlands contain pockets of water-logged marshy areas. this provide suitable habitats year-round for the snail intermediate hosts [12]. More rational prophylactic program based on local epidemiological information is needed for sound fasciolosis control strategies in Ethiopia [6].

Liver fluke (*Fasciola hepatica*) is a parasite affecting a range of livestock and other species. Final hosts in which it can develop to sexual maturity include livestock such as sheep, cattle, horses, pigs, goats, alpacas and deer. Other species include kangaroos, wallabies, rabbits, and humans. The adult worms inhabit the bile ducts and gall bladder of the infected animals, causing severe damage which may lead to death. The disease is characterized by anaemia due to severe liver damage caused by immature fluke tunnelling through the liver parenchyma with extensive haemorrhage that culminates in severe clinical disease. Several complication including weight losses drop in milk production, submandibular edema, significant morbidity, mortality and diarrhoea have been reported in liver fluke infection [13].

In the study area, fasciolosis is the major disease which affects sheep production and productivity in the past that large numbers of sheep were died out. Therefore, this research was proposed to assess the current status of ovine fasciolosis, and to determine some of the risk factors associated with the disease in Debre Berhan Agricultural Research Center.

Material and Methods

Description of the study area

The study was carried out in Debre Berhan Agricultural Research Center (DARC), North Showa Zone, Amhara National Regional State (ANRS). Debre Berhan is a Town and Woreda in Central Ethiopia. Debre Berhan Agricultural Research Center (DARC) is located about 120Km North-East of Addis Ababa on the paved high way to Dessie. The town is found at a latitude and longitude of 9°41'N39°32'E/ 9.683°N39.533°E, respectively and an elevation of 2840m.a.s.l. It was an early capital city of Ethiopia and after wards, with Ankober and Angollela, was one of the capitals of the kingdom of Showa. Today, the Town is the administrative center of Semien Showa Zone of the Amhara Regional State. The study area receives mean annual rainfall of 927.10mm and characterized by a bi-modal rainfall pattern with maximum (293.02mm) and minimum (4.72mm) peaks in August and December, respectively. The maximum and minimum annual temperatures of the area are 17.8 °C and 8.83 °C, respectively. Similarly, the mean monthly maximum and minimum temperatures of the area are 18.6 °C and 8.20 °C, respectively. The total land coverage is 14.71Km. The area is characterized by two seasons, the wet season, from June to September, and dry season, from October to May. The farming system in the area is mixed farming system i.e. crop and livestock rearing [14].

Study animals

The study animals were different sheep breeds kept under Debre Berhan Agricultural Research Center. The study was considered breed wise investigations for the detection of fasciolosis in sheep.

Study design

Cross sectional study design was conducted to determine the prevalence of ovine fasciolosis in the study area.

Sampling method and sample size determination

Sheep were selected randomly based on breed until the required sample size has been met. The sample size was calculated using the formula given by Thrusfield [15] with 50% expected prevalence and 5% accepted error at 95% confidence interval.

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

Where:

N= Required sample size

P_{exp}= Expected prevalence

d= Desire absolute precision (5%)

Therefore, based on the above formula, the numbers of samples of 384 were used as representative sheep for this study. However, based on the population size of the Research Center, the sample size for this research was determined to be 121 sheep.

Method of data collection

Fresh faecal samples were collected directly from the rectum and put in a right sample bottle containing 10% formalin as preservative, and immediately taken in to Debre Berhan agricultural Research Center Laboratory for examination. In the laboratory, faecal sample was screened for the presence of fasciola egg using sedimentation technique. While collecting the faecal samples, the corresponding breed of sheep was recorded.

How to cite this article: Mebrate G, Tewodros A, Dawit A, Aseresie G, Beletu F, et al. Prevalence of Ovine Fasciolosis in Debre Berhan Agricultural Research Center, North Shewa Zone, Ethiopia. Appro Poult Dairy & Vet Sci . 5(5). APDV.000624.2019. DOI: 10.31031/APDV.2019.05.000624

Faecal examination

Faecal examination was carried out through microscopic examination with sedimentation technique. A collection of faecal samples from each sheep was examined microscopically using their morphological features and by the colour of the eggs [16,17].

Data analysis

The total prevalence was calculated by dividing faecal positive result by the total examined animals' times hundred percent. The data was filled in to Microsoft Excel Spread Sheet and were coded and subjected to descriptive statistics using SPSS version 20 software. Values (P-values) i.e. $p<0.05$ were recorded as significant, otherwise, considered as non-significant.

Results

Prevalence

From 121 faecal samples examined, 85 were positive for fasciola eggs with an overall prevalence of 70.2%. The highest prevalence was recorded in Local breeds (57.6%; n=60) while the lowest prevalence was recorded in Exotic breed (7.1%; n=25). The difference in the prevalence of ovine fasciolosis among Local, Cross and Exotic breeds of sheep was statistically significant (X^2=32.277; df = 2; p=0.000) (Table 1 and Figure 1).

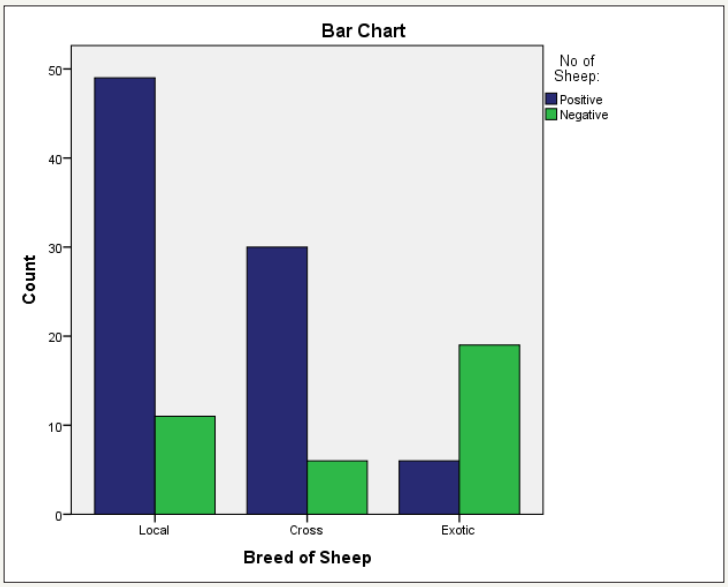

Figure 1: The prevalence of ovine fasciolosis within breeds of sheep at Debre Berhan agricultural research center.

Table 1: Prevalence of ovine fasciolosis among sheep breeds.

Breed	Number of Examined	Number of Positive	Number of Negative	Prevalence
Local	60	49	11	57.6%
Menz	54	45	9	83.33%
Washera	6	4	2	66.67%
Cross	36	30	6	35.3%
Local X Awasi	8	7	1	87.5%
Local X Dorper	28	23	5	92%
Exotic (Dorper)	25	6	19	7.1%
Total	**121**	**85**	**36**	**70.2%**

Chi-Square (X^2)=32.277; df=2; p=0.000

Discussion

Faecal examination was showed that out of 121 faecal samples examined, 85 were found to be positive with an overall prevalence of 70.2%. This study, however, was not in line with the study that was conducted in the same area by Asredie & Shifaw [18] who reported an overall prevalence of 50.8%, and Nuraddis et al. [19] who found an overall prevalence of 24.4% in Municipal Abattoir of Haromaya, Ethiopia. The highest prevalence of the disease recorded in this study might be due to the seasonal variations of the year in which the samples were collected. The disease is more prevalent in wet and/or rainy seasons where snail hosts are plenty. Moreover, the difference might be due to the difference of the climatic conditions and geographical regions such as rainfall, temperature and humidity. However, this finding was perfectly conceded to

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the study where conducted in Menzlalomidir District (70.2%) of Amhara Regional State by Chanie & Begashaw [20].

The present study was also designed to determine prevalence and assess risk factor associated with ovine fasciolosis. It revealed that an overall prevalence of 70.2% based on coprological examinations. The prevalence of the disease in the study area might be attributed to the favorable ecological factors for snails' intermediate host and the parasite.

In this study, the highest prevalence of ovine fasciolosis was recorded in local breeds (57.6%; n=60) followed by cross breeds (35.3%; n=36) and the lowest prevalence of ovine fasciolosis was recorded in Exotic (Dorper) breed (7.1%; n=25) (Table 1 and Figure 1).

According to the statistical analysis of the prevalence of ovine fasciolosis on the basis of each breed was 83.33%, 87.5%, 23.92, 24% and 66.67% in Menze, Local X Awasi, Local X Dorper, Dorper and Washera, respectively. From the local breeds, the highest prevalence was recorded in Menze sheep (83.33%) when compared to Washera (66.67%). From Cross breeds, the highest prevalence was recorded in Local X Awasi (87.5%) when compared to Local X Dorper (23.92%). Similarly, the prevalence in exotic breed (Dorper) was 24%. The difference in the prevalence of ovine fasciolosis among the three breeds was statistically significant (X^2=32.277; df=2; p=0.000) (Table 1 and Figure 1).

Generally, the prevalence was strongly associated with feeding behaviour of sheep. The prevalence of ovine fasciolosis in exotic and cross breeds is lower as compared to local breeds. This is might be associated to exotic and cross breeds were grazed at the dry land with water dry area [21].

In general, fasciola infected sheep, goat and cattle should be effectively treated with oral administration of a narrow spectrum anthelmentic known as Triclabendazole (Fasinex). To sum up, estimation of the economic losses due to fasciolosis at a national or regional level is worked out. However, it is limited by lack of accurate estimates of the prevalence, complexity in disaggregating and quantifying the direct and indirect effects of the disease, and lack of a common procedure for assessing the economic loss. The annual loss due to ovine fasciolosis in Ethiopia is very frequent and causes a significant economic loss either in production loss or decrease productivity and loss of body conditions [22]. As a result, it requires integration and efforts to control the disease. To do that, I think it is necessary to exterminate the snail to control the liver fluke infection. For that, it is effective to exterminate the snail before laying eggs. It is also better if seasons are involved in combating it.

Conclusion

fasciolosis is the major hurdle for sheep production by direct or indirect losses at different part of our country. The high prevalence found in the study could be associated with water lodgment of the area, which is marshy for grazing of sheep, and also poor management system of the farm. Therefore, the highest prevalence was obtained in Debre Berhan Agricultural Research Center because it is favorable to the snail's propagation and multiplication. As a result, there was great economic loss due to fasciolosis in the study area. Therefore, drainage of marshy (wet) areas in order to eliminate snail populations should be incorporated in the control and prevention of this disease. Improving the management strategies, especially grazing trends, housing system and watering behaviour of sheep is also crucial.

Acknowledgment

First and foremost, of all, we would like to thank our almighty God and his Mother Saint Merry for their supports us to complete the overall tasks with the aid of their intervention. Secondly, we greatly thankful to our advisor, Yohannes Muluneh (DVM, MSc, Assit. Prof.), for his logistic supports. We are also very sincerely and want to express our heartfelt thanks to the librarian and our families for their continual support to perform the research. Lastly, we thanks to the technical staffs of Debre Berhan Agricultural Research Center Veterinary Laboratory for their unreserved help in facilitating the laboratory work during this research.

Authors Contribution

In this research, all the authors contributed equally. In detail, Aseresie Getie and Beletu Fekadu: collected the row data for analysis; Hiwet Hadgu and Mebrate Getabalew: investigated all the required laboratory tasks; Nebiyat Zeselase and Aseresie Getie: draft the research; Dawit Akeberegn: Edited and approved the draft; Tewodros Alemneh: Analyzed the data, reviewed and further edited the approved draft, search journals that fit for the research, and published the research.

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