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Original Research

Coprological Prevalence and Associated Risk Factor of Bovine Fasciolosis Around Furda Veterinary Clinic, East Hararghe, Ethiopia

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ABSTRACT

Aim
This study was conducted using the sedimentation method to assess the prevalence and associated risk factors of bovine fasciolosis around Furda Veterinary Clinic, East Hararghe, Ethiopia.

Method
A cross-sectional study design was conducted from October 2020 up to June 2021 to know the prevalence and its associated risk factors of bovine Fasciolosis, taking animal origin, sex, age and body condition as risk factors and standard deviation. The sedimentation technique was used for the recovery of fasciola eggs from fresh fecal.

Results
From a total of 384 animals selected randomly and coprologically examined, 117 of them contained fasciola eggs with a 30.5% total prevalence in the study area. The prevalence of bovine fasciolosis on the basis of animal origin was highest in Gorowodo 23 (28.7%), followed by Dada 24 (30.4%), Harawa 15 (20.5), Rasa Janata 25 (33.8%), and Tirtiro 30 (38.5%). Based on the sexes of animals, the prevalence rate of 74 (32.7%) in females and 43 (27.2%) in males were obtained. While animals of different ages were recorded at 43 (29.9%) and 74 (30.8%), respectively. Whereas 44 (33.6%), 45 (28.8%), and 28 (28.9%) were found to be in poor, moderate, and good physical condition, respectively. All of the risk factors investigated (animal origin, sex, age, and body conditions) were found to be non-significantly associated with the prevalence of bovine fasciolosis (p>0.05).

Conclusion
This study reveals that bovine fasciolosis was a highly prevalent disease in the study area and needs immediate control and prevention by the animal health office and veterinarians working together, treating cattle with anthelmintics before and after the rainy season, and increasing owner awareness about the disease.

Keywords
Coprology; Bovine; Bedeno district; Furda veterinary clinic; Prevalence; Fasciolosis; Risk factors.

INTRODUCTION

The livestock is one of the agricultural sectors that significantly contributes to livelihoods and food security for more than a billion people in different parts of the world.[1] Particularly in African countries, animal products serve as food sources in human diets.[2] That the livestock sector accounts for about 40% of agricultural gross domestic product (GDP), in ranging from 30-80% in individual countries.[3] According to Food and Agriculture Organization (FAO),[4] in Ethiopia livestock is an integral part of agriculture, accounting for about 45% of the total value of agricultural production and supporting the livelihoods of a large population.

Ethiopia ranked 1st by having the largest livestock population of any African country, while the total livestock population for the country is estimated to be about 65.35 million cattle, 39.89 million sheep and 50.50 million goats. 2.11 million horses, 8.98 million donkeys, 0.38 million mules, 7.70 million camels and

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a 48.96 million poultry population.[5] Although Ethiopia possesses a large livestock population with genetic diversity, its productive performance is low due to poor nutrition, high prevalence of diseases, poor genetic resource improvement and management, poor market infrastructure and inappropriate development policies and a shortage of veterinarian,[6] The country loses about 52 million animals annually due to disease.[5]

Among the diverse animal diseases recorded in Ethiopia, the helminth parasite is one of the most important factors that induce economic impact at a country's level. Fasciolosis is one of the most important parasitic diseases that hamper livestock production particularly by inducing liver damage, low weight gain, and reducing milk production.[7]

Fasciolosis is an important limiting factor for ruminant production and causes several economic losses due to morbidity and mortality in Ethiopia. The disease is caused by either of two etiological agents, *Fasciola hepatica* or *Fasciola gigantica*.[8] *Fasciola hepatica* and *Fasciola gigantic* have similar life cycles. The adult fluke inhabits the bile ducts of the final host and produces eggs, which are expelled with the bile into the intestine and shed in the faces. The eggs embryonate and hatch in water or wet pastures, releasing miracidium that searches, penetrates, and changes into cercariae in the intestines of intermediate hosts (snails). The cercariae are released from the snail and encyst as metacercariae on aquatic vegetation. After ingestion by the final host, the young flukes are released from the cysts in the small intestine. They penetrate the intestinal wall and migrate through the abdominal cavity and the liver capsule into the liver parenchyma, then enter the bile ducts where they mature and commence egg production.[9]

Bovine fasciolosis exists in almost all parts of Ethiopia. This is due to the country's containing optimal temperature and moisture for development and survival of the fluke as well as breeding intermediate snail hosts.[10] The prevalence of fasciolosis is increasing from year to year in the country due to the implementation of irrigated agriculture, which has been expanding in many parts of the country, creating favourable habitat for fluke and snail vectors,[11] where *Lymnaea natalensis,* an aquatic snail and *L.truncatula* an, amphibious snail act as an intermediate host for *F. gigantic* and *F. hepatica*, respectively.[12] Control and prevention of fasciolosis include snail population reduction through habitat destruction, the use of anthelmintics to reduce pasture contamination by fluke eggs, and environmental sanitation through drainage of the area.[13] Despite its higher incidence and the presence of a number of fasciolosis-related problems, there has been no previously well-documented research on bovine fasciolosis conducted in the study area, where cattle are valuable assets to the owner. Therefore, the objectives of this study are: to determine the prevalence of bovine fasciolosis around Furda Veterinary Clinic, Bedeno District, East Hararghe, Ethiopia and to identify major risk factors for the fasciola.

MATERIALS AND METHODS

Study Area

The study was conducted at the Furda Veterinary Clinic in the Bedeno district of the Eastern Oromia Region, Ethiopia. Based on data obtained from the Bedeno Woreda Agricultural Office (BWAO), the Wereda contains enormous number of livestocks about 212842 cattles, 235613 goats, 99426 sheeps, 34108 donkeys, 128 horses, 10 mules, 91 camels and 379157 chicken. The economy of the population depends on livestock and livestock products, especially cattle. They send milk to Haramaya and Awaday cities and fattened ox to the Somali region. The area is located 547 km east of Addis Abeba and 47 km west of Harar. The area contains 97410 total hectares and the climatic condition of the Wereda is divided into three. They are: temperate rainy, tropical rainy and tropical dry agro-climatic zone covering about 32%, 48% and 21% of the total area, respectively. The geographical location of the area is found at 8°52'30 N, 9°13'30" N latitude and 41°30'0" E, 41°50'0" E longitude. The altitude is from 1200 to 3381 m above sea level and the wereda has an average annual temperature of 22 °C and the mean annual rainfall of the area ranges from 400 to 1200 mm.

Study Animal

A total of 384 local breeds of cattle managed extensively were randomly selected and subjected to coprological examination by standard sedimentation technique to know the prevalence and its associated risk factors of Bovine *Fasciolosis* in the study area.

Study Design

A cross-sectional study design was used to determine the coprological prevalence of Bovine fasciolosis and its associated risk factors around Furda Veterinary Clinic in the Bedeno district from October 2020 to June 2021 by taking origin (sites), age, sex and body conditions as the risk factors for the disease occurrence.

Sample Size Determination

For estimation of *Fasciolosis* prevalence, by using a simple random sampling method used the sample size was determined by using the standard formula described by Thrusfield.[14] The expected prevalence was 50%, the statistical confidence interval level was 95% while the desired precision was 5% and the sample size was 384 because there had been no conducted studies in this area previously.

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

Where, n=required sample size; pexp=expected prevalence;
d=absolute precision

Study Methodology

Sample collection: For coprological examination, sampling was carried out randomly from five sites of Gorowodo, Dada, Harawa, Rasajanata, and Tirtiro, with the inclusion of age, sex, body condition, and origin of animals from five localities. Approximately 15 gm of fecal samples were taken directly from the rectum of selected cattle using a disposable plastic glove and placed in universal bottles by adding 10% formalin as a preservative and recording animal identity such as study site, sex, eggs, body condition and

management system and transported to Bedeno Livestock Development Office (BLDO), Furda Veterinary Clinic, parasitology laboratory for detailed coproscopic examination. The fecal samples were kept at 4 °C and examined parasitologically.

Coprological examination: The sedimentation technique was used to detect the presence or absence of fasciola eggs in the collected fecal samples. The procedure of sedimentation was conducted according to Palmer.[15] From collected fecal samples, 10 gms of feces was measured and put in to beaker of 500 ml size and mix with 100 ml of tap water using spatula to homogenize fecal sample, then putting sieves with different size, one on to the other according to their size and pouring homogenized feces from the first beaker through the sieve into the other until the water is clear. The procedure is continued by removing the largest sieve and continue the procedure until the smallest sieve remain, pour filtrate from container to sedimentation flask through 45° horizontal incline sieve and make up to 100 ml mark with tap water and start the timer for 6 min. After that pour off supernatant from sedimentation flask using pipette up to 20 ml mark. Then add tap water until 100 ml mark and repeat the process until the supernatant is clear. Then reduce filtrate to the 10 ml mark, add one (1) drop of methyle blue and kept remain undisturbed for 5 min and viewed under a compound microscope at 25x magnification power. The fasciola eggs are viewed as golden yellow with indistinct operculum.

Data Management

Data records during sampling and laboratory findings was entered and stored in a Microsoft excel spread sheet. The data was analyzed for errors that exist and properly coded before being subjected to statistical analysis. Then the data from the Microsoft excel sheet was processed and analyzed by using the statistical package for the social sciences (SPSS) software program (SPSS version 20) to determine the variation in infestation prevalence in risk factors (study site, sex, age, and body condition), In all cases, the difference between parameters was tested for significance at a probability level of less than 0.05 ($p<0.05$).

RESULTS

Prevalence of Bovine Fasciolosis

The coproscopic examination conducted from October 2020 to June 2021 showed that from the total of 384 cattle selected and examined for the presence of fasciola eggs using sedimentation technique, 117 fecal samples obtained from the case contained fasciola eggs with an overall prevalence of 30.5% in the study area.

Prevalence of Bovine Fasciolosis Based on Risk Factors

Prevalence of bovine fasciolosis based on origin: Out of 384 cattle examined for the prevalence of bovine fasciolosis in the Beddenno district, 117 cattle were found positive for fasciolosis. A high prevalence was recorded at Tirtiro site 30 (38.5%) and a lower prevalence was recorded at Harawa site 15 (20.5%). But as a result, as recorded by Legesse,[16] at Zanzelma, Diilbato et al[17] at Abeshege. Statistical analysis showed that there were statistically not significant variations in the prevalence of bovine fasciolosis ($p>0.05$) among study sites as indicated in Table 1.

Table 1. *Prevalence of Bovine Fasciolosisin Bedeno District Based on Sites*

Site	No Animals Examined	No Positive	Prevalence (%)	X^2	*p*-value
Gorowodo	80	23	28.7%	6.239[2]	0.182
Dada	79	24	30.4%		
Harawa	73	15	20.5%		
Rasajanata	74	25	33.8%		
Tirtiro	78	30	38.5%		
Total	384	117	30.5%		

Prevalence of bovine fasciolosis based on sex group: From 226 randomly selected females, randomly selected 74 were positive with a 32.7% prevalence. Out of 158 selected males, 43 were positive with a 27.2% prevalence. Statistical analysis shows no significant difference ($p>0.05$). in the prevalence of the disease between females and males (Table 2).

Table 2. *Prevalence of Bovine Fasciolosis Based on Sex*

Sex	No Animal Examined	No Positive	Prevalence (%)	x^2	*p*-value
Female	226	74	32.7%		
Male	158	43	27.2%	1.341[2]	0.247
Total	384	117	30.5%		

Prevalence of bovine fasciolosis based on age group: In our study, animal age was determined according to the statement of Cringoli et al,[18] when young age <4-years and adult age 4-years-old. Out of 144 young members, 43 (29.9%) were selected as positive. In that case, 240 were selected as adults, and 74 (30.8%) were positive. There was no statistically significant difference ($p>0.05$) between the age groups as shown in (Table 3).

Table 3. *Prevalence of Bovine Fasciolosis Based on Age*

Age	No of Animal Examined	No of Positive	Prevalence (%)	x^2	*p*-value
Young	144	43	29.9%		
Adult	240	74	30.8%	0.040[2]	0.84
Total	384	117	30.5%		

Prevalence of Bovine Fasciolosis in Body Condition

During our study period cattles were classified for inclusion in their body condition according to Nicholson et al.[19] Out of 384 cattle selected randomly, 131 poor body condition examined with 44(33.6%) positive, 156 moderate body condition with 45(28.8) positive and 97 good body condition with 28(28.9%) positive. There was no statistically significant difference ($p>0.05$) in cattle with difference body condition score. As shown in Table 4.

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Table 4. *Prevalence of Bovine Fasciolosis Based on Body Condition*

Body Condition	No of Animal Examined	No of Positive	Prevalence (%)	x^2	*p*-value
Poor	131	44	33.6%		
Moderate	156	45	28.8%	0.913[2]	0.633
Good	97	28	28.9%		
Total	384	117	30.5%		

DISCUSSION

The result of the present study revealed an overall prevalence of fascioliasis is 30.5% in the study area. This finding is similar to the results of Chakiso et al[20] in Lemo District, Asmare et al,[21] in Dangila District. This results also in line with Abdi et al[22] at Mecha District, Tulu et al[23] at Jimma Horro District. However, higher prevalences than in the present study of 53.91%, 41.41%, 40.62%, and 39.6% were reported by Beyene et al[24] in Haramaya Town, Eshetu et al[25] in Angacha District, and Tamiru et al[26] in Hulet Ejju Enesie District, respectively, and lower prevalences of 20.8%, 24.4%, and 19.5% were reported by Mamo et al[27] in Beddelle District, and Yusuf et al[28] at municipal abattoir of Haramaya, Girma et al,[7] at Hirna town, respectively. This variation may be due to changes in ecological and climatic conditions such as altitude, rainfall, and temperature for the presence of their intermediate snail hosts, the expansion of veterinary services, excessive use of fasciolicidal drugs by animal owners, public awareness of the benefits of periodic deworming of animals, or local husbandry conditions.[29,30]

Animal sex was not associated with the infestation rate. Temesgen[31] and Abera et al.[32] found no sex-related differences in the prevalence of fasciolosis, which is similar to our findings. This could be associated with similar management given to both male and female cattle's. Moreover, it might also be that fasciolosis is not a disease directly related to the animal reproductive system.[33] However, the results of the present study differ from those of El-Tahawy et al[34] who suggested that the prevalence of fasciolosis was significantly higher in females than in males. This could be due to physiological stress caused by breeding and milking reducing the development of immunity against infection.

The present result on a statistical analysis of infection rates among the age group shows prevalence of fasciolosis was not statistically significant ($p>0.05$). This result was in agreement with Kebede et al[35] at Sayo District, Husen et al[36] at Gechi District and Tsegaye et al[37] at Woreta. This showed that age groups do not affect the presence or prevalence of fasciolosis; that young and adult animals were equally exposed to infection. In this survey, both animals shared grazing lands and watering points commonly. But it was higher in adult animals (30.8%) than in the young (29.9%) the infestaction rate (prevalence) increased as age advances. This contradicts with the finding Bayou et al[38] at Haranfama Municipal Abattoir who report prevalence decrease as age increase, this may be due to the result of acquired immunity with age which is manifested by a humoral immune response and tissue reaction in the bovine liver due to previous challenge. Liver fibrosis which impedes the passage of immature flukes acquired thickening, stenosis and calcification of bile ducts form unfavorable site for adult parasites and consequently fasten their expulsion.

This study also revealed that the body condition score has no association with fasciolosis infestation rate. The highest rate of infestation was recorded in those animals having poor body conditions (33.6%), followed by those having good body conditions (28.9%), while the lowest prevalence was recorded in those animals having moderate body conditions (28.8%). This finding corresponds with the results reported by Zewde et al[39] who found no relation between body condition differences in the prevalence of fasciolosis. However, these results contradict those of Birhan et al[40] at the Dabra-Tabor municipal abattoir. This might be associated with less resistance as a result of malnutrition; poorly nourished animals appear to be less competent at getting rid of infection, although it is not unusual for well-fed animals to succumb to the disease. Similarly, other infections (parasitic or non-parasitic) might make animals in poor physical condition susceptible to fasciolosis. Their existence, along with fasciolosis, might have an impact on the body condition and body weight of the animals.[41]

CONCLUSION AND RECOMMENDATIONS

According to the present study, bovine fasciolosis is the most widely spread disease, with an over-all prevalence of 30.5%. This was due to the poor livestock health management policy, geographical location and human activity creating a suitable habitat for breeding snails, intermediate hosts, where there existed more swampy areas and the formation of irrigation systems for more chat growth, and owners grazing their animals around due to lack of animal feed. All risk factors, including animal origin, sex, age, and body condition, were not associated with the prevalence rate of bovine fasciolosis. Its higher prevalence indicates that bovine fasciolosis is an important disease that hinders cattle productivity and reduces the economy of the area. In conclusion, the owner of the animals should be aware of the effect of fasciolosis on livestock and work on ways to control and prevent its effects. Besides, avoid grazing of cattle in a swampy area, fencing or drainage of stagnant water and periodic treating of cattle with anthelmintics before and after the rainy season.

ETHICAL STATEMENT

There were no ethical committees or institutional review boards established for conducting this study. But this research was conducted under the supervision of the Bedeno Woreda Livestock Development Office, which critically reviewed and concluded that this work was ethically conducted and followed all the animal ethics and welfare guidelines.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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