

Prevalence and Associated Risk Factors of Ovine Fasciolosis in Dedo District, South West of Ethiopia

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Abstract: A cross-sectional study was carried out in Dedo district of Jimma zone of Oromia region from November 2015 to April 2016 to determine the prevalence and putative risk factors of ovine fasciolosis in Dedo district. A total of 384 fecal samples were randomly collected directly from the rectum of individual animals. Parasitological investigation was performed using sedimentation technique. From a total of 384 coprologically examined sheep, 88 animals were found positive for fasciolosis with an overall prevalence of 22.9%. The prevalence rate of fasciolosis in adult sheep (29%) was higher than in young sheep (8%) and the difference was statistically significant ($P < 0.05$). Animals with a poor body condition scores have the highest prevalence among the three categories of body condition with 38.2% in poor body conditioned sheep followed by medium, 11.2% and 3.5% finding was recorded in good body conditioned ovine's. The difference between the prevalence of ovine fasciolosis among different body condition score was statistically significant ($P < 0.05$). There was no statistically significant difference ($P > 0.05$) between male and female sheep, even though the (22.8%) was observed in female animals while (23.2%) was observed in male animals. In the present study, the highest infection with fasciolosis was found from highland (31.7%) agro ecology, followed by mid highland (9.9%) and the lowest finding from lowland (14.5%) study area with statistically significant difference ($p < 0.05$). Both *Fasciola hepatica* and *Fasciola gigantica* were the species prevalent in the study area with mixed infection. From this study it was concluded that ovine fasciolosis was prevalent, thus posing economic loss in the study area. Hence, control strategies targeted on the parasite and the intermediate hosts as well as implementation of appropriate grazing management in the study area are warranted.

Key words: Agro Ecology • Cross-Sectional • Dedo District • Fasciolosis • Prevalence • Sheep

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country and still promising to rally round the economic development of the country [1] with an estimated population of 7.8 million equines, 1 million camels, 47.5 million cattle, 39.6 million chickens, 26.1 million sheep and 21.7 million goats [2].

Small ruminants play a significant role in maintaining household stability by providing meat, milk, skin and

wool, generate cash income and play traditional social and religious roles [3]. Among the small ruminants in Ethiopia, sheep are the dominant livestock, providing up to 63% of cash income and 23% of the food subsistence value obtained from livestock production [4]. Regardless the large size of the sheep population in the country and the huge potential there in; the productivity per animal and the contribution of this sub-sector to the national economy is relatively low due to multitude of constraining factors including malnutrition, diseases, improper health care and other management problems [5, 6].

In the diverse agro-climatic zones of Ethiopia, small ruminants are important source of income for rural communities and are one of the nation's major sources of foreign currency from 000 exports. The country has, however, benefited little from this enormous resource owing to a multitude of problems, disease being the most important productivity losses attributable to helminthes parasites are often substantial [2]. Gastro-intestinal helminthosis is considered as one of the major parasitic problems that constrain livestock improvement programs in Ethiopia. Fasciolosis is the helminthosis that causes direct and indirect losses of domestic animal immunities [7].

Infectious and parasitic diseases are common traits that affect productivity [6]. Parasitic infections pose a serious health threat and limit the productivity of livestock due to the associated morbidity and mortality [8]. Vast numbers of parasitic diseases are incriminated to play a detrimental role in hampering small ruminant production leading to serious economic loss [9].

Fasciolosis is one of the most prevalent helminthes infections of ruminants in different parts of the world. Particularly in its sub clinical forms where it has been shown to reduce growth rates, feed conservation, fertility and milk yield [10, 11]. Fasciolosis is caused by digenea trematode of the genus *Fasciola* consisting of two species usually implicated in causing the disease namely *F. hepatica* and *F. gigantica*. Ruminants are the natural hosts for *Fasciola* among which sheep and cattle suffer the highest infection [11, 12]. Fasciolosis is an economically important disease leading to huge financial losses due to morbidity and mortality and also due to liver condemnation there by contributing to loss in productivity of livestock industry in Ethiopia. Ahmed *et al.* [14] reported an annual loss of 48.4 million Ethiopian Birr per year due to ovine fasciolosis.

Considerable work has been done on the prevalence and economic significances of ovine fasciolosis in many parts of Ethiopia [14-16] however, no report so far has been published on the level of fasciolosis in the present study areas, where sheep are important assets to the local farmers.

Therefore, the objectives of the study were:

- To determine the prevalence of ovine fasciolosis and
- To assess the risk factors that might contribute to the disease in the study area.

MATERIALS AND METHODS

The Study Area: The study was conducted from November 2015 to March 2016 in Dedo district of Jimma zone. The district was located in Oromia Regional state at 372km south west of Addis Ababa. The district possesses different climatic condition ranges 880-2400m above sea level and located at longitude of 35°52'-37°37'E and latitude of 7°36'-8°56'N. The climatic conditions of the areas are approximately categorized as 75% highland (Dega), 23% mid highland (Weinadega), 2% lowland (Kola). During the study time, the study area received a mean annual rain fall of about 1530mm which came from long and short rainy seasons. The average minimum and maximum annual temperatures were 7°C and 30°C, respectively. Agriculture is the livelihood for more than 90% of the population in rural farming community in district. The main agricultural system in the Dedo district is mixed crop livestock production and animals are mainly produced in an extensive system [17].

Study Population: The study animals were sheep kept under traditional extensive management system of indigenous breed with different age, sex, body conditions found in Dedo district.

Study Design: A cross-sectional study design was used and the overall prevalence and putative risk factors that might contribute to the disease were estimated as to their association to ovine fasciolosis.

Sample Size and Sampling Method: Simple random sampling was followed and the study animals were selected. On the basis of proportion of ovine population and agro ecology in a selected Kebele's numbers of animals used for sample from each Kebele were determined. Animals within the selected peasant association were selected as they represent both kebele and agro ecology of the district. Households were selected using simple random sampling. The sample size for the study animal was calculated on the basis of 50% prevalence of ovine fasciolosis in study area. It was computed with the expected precision at 5 and 95% confidence interval and a total of 384 animals were sampled according to Thrusfield [18] formula.

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

where;

n = Sample size

p = Expected prevalence (50%)

1.96 = the value of Z at 95% confidence level

d² = Desired absolute precision = 5%

Therefore, sample size was calculated to be 384 sheep.

Study Methodology: Fecal samples for parasitological examination were collected directly from the rectum of the sheep to determine the prevalence of ovine fasciolosis. During sampling, animals sex, age and body condition score was recorded. The body condition were grouped in to three and animals that score 0, 2 and 3 classified as poor, medium and good respectively according to MoARD [19]. The age of sheep were classified in to two; sheep with the age of up to 1 year as young and sheep with more than 1 year as adult [19].

Cooprological Examination: Fecal samples were examined in the laboratory to determine the prevalence of the disease. The sample was taken with a disposable glove and collected by universal bottle and transported to the laboratory for fecal examination. A sedimentation technique was applied to see the *Fasciola* eggs.

Data Management and Analysis: Data was recorded and managed with excel spread sheet. Descriptive statistics and frequency distribution was made for the determination of means of parasite prevalence. Comparison of positivity of parasitism was made by chi square test. A statistical analysis was using SPSS version (16) software. The significant level was determined at P< 0.05 for all statistically analyzed tests.

RESULTS

Prevalence of Ovine Fasciolosis: Out of the total of 384 fecal samples collected and examined 88 were positive for ovine fasciolosis with overall prevalence of 22.9%. Of the total, 259 (67.4%) were female, 125 (32.6%) were male whereas, 112 (29.2%) were young and 272 (70.8%) were adult with different body condition.

Prevalence of Ovine Fasciolosis Based on Origin: The prevalence of ovine fasciolosis is different in different site of the study areas. Based on peasant association there was strongly statistically significant difference (P<0.05) as summarized in (Table 2).

Table 1: Demographic history of the sampled animal

Variable		Frequency	Percent
Sex	Male	125	32.6%
	Female	259	67.4%
Age	Young	112	29.2%
	Adult	272	70.8%
Body condition	Poor	191	49.7%
	Medium	107	27.9%
	Good	86	22.4%
Agro- ecology	Low land	55	14.3%
	Mid highland	111	28.9%
	Highland	218	56.8%
Pas	Ofole	111	28.9%
	Adicho	218	56.8%
	Waro	55	14.3%
Result	Negative	296	77.1%
	Positive	88	22.9%

Table 2: Prevalence of ovine fasciolosis based on origin

PAS	No. examined animal	No. positive	Likelihood ratio	p-value
Adicho	218	69 (31.7%)	23.883	0.001
Ofole	111	11(9.9%)		
Waro	55	8 (14.5%)		
Total	384 (100%)	88 (22.9%)		

Table 3: Prevalence of ovine fasciolosis based on age

Age	No. examined animal	No. positive	Likelihood ratio	p-value
Young	112 (29.2%)	9(8%)	22.965	0.001
Adult	272(70.8%)	79 (29%)		
Total	384 (100%)	88(22.9%)		

Prevalence of Ovine Fasciolosis Based on Age: The study conducted to see the influence of age on the prevalence of ovine fasciolosis revealed that there was higher prevalence rate (29%) in adults and lower prevalence rate in young aged animals (8%) and there was statistically significant difference (P<0.05) (Table 3).

Prevalence of Ovine Fasciolosis Based on Body Condition: Animals with a poor body condition scores have the highest prevalence among the three categories of body condition with 38.2% followed by medium, 11.2% and 3.5% finding was recorded in good body conditioned ovine's. The difference between the prevalence of ovine fasciolosis among different body condition score was statistically significant as shown in (Table 4) (P<0.05).

Prevalence of Ovine Fasciolosis Based on Sex: Slightly higher prevalence 29 (23.2%) was observed in male animals while lower prevalence 59 (22.8%) was observed in female animals. The difference between ovine fasciolosis among different sex was statistically insignificant (P>0.05) (Table 5).

Table 4: Prevalence of ovine fasciolosis based on body condition score

Body condition	No. animal examined	No. positive	Prevalence (%)	Likelihood ratio	p-value
Poor	191 (49.7%)	73	38.2%	58.170	0.001
Medium	107 (27.9%)	12	11.2%		
Good	86 (22.4%)	3	3.5%		
Total	384 (100%)	88	22.9%		

Table 5: Prevalence of ovine fasciolosis based on sex

Sex	No. examined animal	No. positive	Likelihood ratio	p-value
Male	125 (32.6%)	29(23.2%)	0.008	0.927
Female	259 (67.4%)	59(22.8%)		
Total	384 (100%)	88(22.9%)		

Table 6: Prevalence of ovine fasciolosis based on agro- ecology

Agro-ecology	No. examined animal	No. positive	Likelihood ratio	p-value
Highland	218	69 (31.7%)	23.883	0.0001
Mid highland	111	11 (9.9)		
Lowland	55	8 (14.5%)		
Total	384 (100%)	88 (22.9%)		

Prevalence of Ovine Fasciolosis Based on Agro- Ecology:

The prevalence of ovine fasciolosis recorded in the different Peasant Associations of each Kebele's with different agro climate was 31.7% in highland, 9.9% in mid highland and 14.5% in low land. This difference in the prevalence was statistically significant ($p < 0.05$) as indicated in (Table 6).

DISCUSSION

Fasciolosis is an important parasitic disease of domestic ruminants caused by two liver fluke species: *Fasciola hepatica* and *F. gigantica* (Trematoda). The result of the present study was indicated that ovine fasciolosis prevalence of 22.9% (88/384) in the study area. This study on prevalence of ovine fasciolosis is relatively in agreement with the previous report from the middle Awash River basin report by Ahmed *et al.* [13], Musa [20] in Bahir Dar (15.8%), Daniel [21] in Dire Dawa (14.8%) and Wassie [22] in Nekemte.

The present finding is relatively lower than previous finding by Ewnetu *et al.* [23] in Mecha (38%), Dinka [24] in Assela (32.9%) and Adem [10] in Zeway (30.4%). This variation might be attributed to the difference in the infection level of study area and the present study was conducted relatively within short period of the year when the infection rate of fasciolosis is low. The results of the present study revealed that body condition score, age and agro ecology have significant effect on the prevalence of ovine fasciolosis. The prevalence of the disease in the study area may be attributed to the favorable ecological factors for the snail intermediate host

and the parasite. The area is partly water lodged swampy and marshy area which was suitable for the intermediate host (Snail) to continue the lifecycle [12, 25].

This finding was in contrast with previous studies observed at different regions by Michael [25] who reported the prevalence as 51% in DebreZeit, Garoma and Wakuma, [26] in Shambu municipality (51.60%), Ahmed [27] in Kombolcha (51%), Yadeta [14] in Western Shao (70.4%), Mezgebu [28] in Addis Ababa (63.8%), Amsalu [29] in East Gojam (53.2%), Fikadu [30] in Bahir Dar (60.2%), Bitew *et al.* [16] who report 49% prevalence in his study of ovine fasciolosis which was conducted in and around Dawa-Chaffa -Kemissi and Yilma [31] in Holeta (49%).

In general the low prevalence rate than the previous work might be due to difference in, increasing awareness of peoples for the disease, decrements of swampy areas and it may also be due to the improvement of veterinary services. When prevalence of ovine fasciolosis was calculated among the different peasant associations under study, highest prevalence was registered in Adicho (31.7%) and lowest prevalence was found in both Ofole (9.9%) and Dawe (14.5) with statistically significant difference ($P < 0.05$). The variation in the prevalence of the disease is may be due to the higher degree of swampness, number of rivers and streams; high moisture nature of most of the grazing areas or accessibility of sheep to swampy communal grazing land which is the main factor for the presence of variation in the prevalence in these peasant association. The difference might also be attributed to the difference of the altitude and other ecological conditions [32].

The present study indicated that there was highly significant difference between age groups, which agrees with reports of Ahmed *et al.* [13], Bitew *et al.* [16] and Ayalew, [33]. This study revealed that prevalence of fasciolosis was higher in sheep with increase of age. This could be due to the fact that young animals are not allowed to go far with adult animals for grazing/feeding reducing the chance of exposure to infective metacercaria as compared to adults and longtime exposure in adult. The long prepatent period of the disease has effect not to be seen in young animals. Moreover Ahmed *et al.* [13] suggested that the higher risk of exposure of adult might be due to physiological differences including stress, pregnancy and nutritional imbalances.

Study was also carried out on prevalence of ovine fasciolosis based on body condition. The results of this finding indicated that infection rates in poor body conditioned were significantly higher ($P < 0.05$) than that of medium and good body conditioned animals. This signifies that the importance of fasciolosis in causing weight loss and is characteristic sign of the disease. Reports of Ahmed *et al.* [13] and Bitew *et al.* [16] conducted on ovine fasciolosis as well were in line with the current finding. Sheep of poor body condition are vulnerable to parasitic diseases [34].

The prevalence of the disease in female and male animals was recorded as 15.4% and 7.6%, respectively. There was no significant difference ($P > 0.05$) between the two sexes as that of absence of significant sex related differences reported by Asegde [35].

CONCLUSION AND RECOMMENDATIONS

The result of the present study indicated that fasciolosis is moderately prevalent in the study area. Fasciolosis is relatively more prevalent in poor body conditioned animals than in medium and there was mild prevalence of fasciolosis in good body conditioned animals. The relatively moderate prevalence reported in female adult sheep in this study has clearly indicated lack of full strategic control measures against the disease. Decrease in fasciolosis prevalence from time to time might be due to climatic change, decrease in marshy areas and improved veterinary service.

Based on the above conclusion, the following recommendations were forwarded.

- Strategic anthelmintic treatment with appropriate flukicide drug should be practiced twice a year; before and after rainy seasons to eliminate fluke

burden of the host animals and minimize pasture contamination by fecal egg shedding thus interrupting the life cycle.

- To control infection of farm animals with metacercaria, grazing on wet pasture favorable to the snails or on the margin of pools or slow running streams should be prevented either by keeping the animals off these area or by fencing of dangerous areas.
- The field veterinarians should aware sheep owners on importance and burden of *Fasciola* in sheep.
- Further epidemiological study should be conducted in the area including environmental factors like management conditions that helps to design an appropriate control measures.

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