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Prevalence of Ovine Fasciolosis in Damot Sore Woreda, Wolayta Zone, Ethiopia

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Abstract: Fasciolosis is one of the most common economically important parasitic diseases of domestic livestock; particularly in sheep responsible for wide spread morbidity and mortality. A cross-sectional study was conducted on 384 sheep kept in Damot Sore district of Wolayta zone from November 2015 to May 2016 with the aim of determining the prevalence of ovine fasciolosis by coprological examnation. For the purpose of this study, fecal samples were collected from 384 sheep and examined using sedimentation technique to identify eggs of fasciola. The overall prevalence of fascioliasis was 18% in the study area. Infection rates for the different age groups were found to vary with statistically significantly ($p<0.05$). Infection rates for sheep with poor body condition (36.51%) were higher than sheep with medium (21.02%) and good (7.92%) body conditions respectively. However, no statistical significance ($P > 0.05$) was observed for sex variables but the prevalence of ovine fasciolosis was higher in female sheep (18.66%) than males (16.38%). Further prevalence surveys should be carried out to strengthen the result for better understanding on the epidemiology of ovine fasciolosis in the study area. According to this finding it is recommended that farmers who rear sheep should improve provision of feeds to their animals so that the animal can have good body condition that confers some level of resistance against fasciolosis.

Key words: Coprology · Damot Sore · Ovine Fasciolosis · Prevalence · Wolayta Zone

INTRODUCTION

In Ethiopia, more than 80% of the human population depends on agriculture for their livelihoods and usually keep livestock as mixed crop-livestock production systems or as pastoralists [1]. The country has the largest livestock population in Africa, particularly with the number of sheep currently estimated at 33 million [2]. Production of sheep for meat, milk, wool, hair, skin and manure is an attractive agricultural enterprise for Ethiopian farmers because of the relatively low cost of breeding stock, the high productive rate of sheep and the source of cash income. Sheep requires minimal inputs and maintenance costs to live in various conditions, from desert to humid rainforest [3]. 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 sector [4].

Despite the large size of the sheep population in the country, the productivity per animal and the contribution of this sub-sector to the national economy is relatively low because of the number of factors such as recurrent drought, infrastructures problem, rampant animal diseases, poor nutrition, poor husbandry practices, shortage of trained man power and lack of government policies for disease prevention and control [5]. Among the animal diseases that mainly hinder the animal health are parasitic infections that have great economic impact, especially in developing countries. From the various species of gastrointestinal and pulmonary helminth parasites, trematode is known to be prevalent in Ethiopia [6]. Among the trematode infestation, fasciolosis is one of the most common economically important parasitic diseases of domestic livestock, particularly in sheep responsible for wide spread morbidity and mortality by reducing weight gain, decreased lambing percentages, poor growth rate of lambs, weight loss, anemia, hypoproteinemia and increased costs for replacement stock [7]. To this end, understanding the magnitude of infestation is imperative towards the various efforts undertaken to control the parasite. Because knowledge on the epidemiology and risk factors of the parasite is crucial for any attempt of prevention and control of disease [8]. In Ethiopia variable prevalence rates of ovine fasciolosis

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was reported in different localities. Different factors that are contributing for this variable prevalence rate of fasciolosis are availability of suitable snail habitats, as trunculata prefers wet mud to free water and permanent habitats include the banks of ditches or streams and the edges of small ponds [9]. Following heavy rainfall or flooding, temporary habitats may provide by hoof marks, wheel ruts or rain ponds. Fields with clumps of rushes are often suspect sites. In addition, a slightly acidic pH environment is optimal for *Lymnaea truncatula,* where as excessive acidic pH levels are detrimental, such as occur in peat bogs and areas of sphagnum moss. Such conditions are also essential for the development of fluke eggs, for miracidia searching for snails and for the dispersal of cercariae being shed from the snails [10]. It is also evident that water resources can play a significant role in improving food security and household income [5]. But wrongly planned irrigation, however, impedes production and results in wasted effort by favoring the incidence and spread of common water borne animal diseases such as fasciolosis, which are known to cause significant economic losses [5, 9].

In Ethiopia, fasciolosis (*Fasciola hepatica* and *Fasciola gigantica*) infestation occurs in areas above 1800 m and below 1200 m above sea level, respectively. In between these altitude limits, both species coexists where ecology is conducive for both snail hosts and mixed infections prevail [11]. This has been attributed to variations in the climatic and ecological conditions such as rainfall, altitude and temperature and livestock management system [12]. Ovine fasciolosis in country is very frequent and causes a significant economic loss either in production loss or decrease productivity and loss of body condition [13]. Although number of studies have been undertaken and published with regard to the prevalence of ovine fasciolosis in different parts of Ethiopia [14], very little has been done in different parts of Wolayta zone in general and no published report in Damot Sore district in particular. As a result there is paucity of well documented information on the occurrence of fasciolosis in the study area. Therefore, the objectives of this study were to determine the prevalence of ovine fasciolosis, to identify major risk factors associated with the occurrence of ovine fasciolosis in the study area.

MATERIALS AND METHODS

Study Area: The study was conducted in Damot Sore district of Wolayta zone, SNNPR. Damot Sore woreda is bordered on the south east by Sodo Zuria, on the west by Kindo Koyisha, on the North West by Boloso Bombe and on the north by Boloso Sore woreda and it was separated from Boloso Sore woreda. Damot Sore woreda is located in between 6°51" and 7°35" North latitudes and 37°46" and 38°1" longitude and it is at an altitude ranging from 1500 to 1800 meters above sea level. It has an average annual rain fall of 1200 millimeters per year. Damot Sore woreda is typically bimodal with three distinct seasons; dry from November to February, small rains from March to June and big rains from July to October in the district [15, 16]. The mean annual maximum and minimum temperature of the area is 21^0 and 14°C respectively all year round. The livestock population in Damot Sore district was estimated at 70, 853 bovine; 9, 772 ovine; 3, 318 caprice; 3, 467 equine; 36, 869 poultry [17]. The predominant farming system is a mixed crop livestock production.

Study Animals: A total of 384 heads of ovine were randomly selected and subjected to qualitative coprological examination. The selected animals were from local breeds of different age, body condition and sex groups. Age determination (young <1, adult 1-3, old >3) year and also body condition of each animal was determined based on the criteria set by Thompson and Meyer [18]. Animals were visually assessed followed by palpation of the area around the lumbar vertebrae between the back of the ribs and the front of the pelvic bones. However, for convenience, the animals were categorized in to poor, medium and good body conditions.

Study Design: A cross sectional study was conducted from October 2015 to May 2016 to determine the prevalence of fasciolosis in Damot Sore district of Wolayta zone, Southern Ethiopia

Sampling Methods and Sample Size Determination

Sample Size Determination: To determine the sample size, an expected prevalence of 50% was taken into consideration since there was no research work on ovine fasciolosis in the area. The desired sample size for the study was calculated using the formula given by Thrusfield [19] with 95% confidence interval and 5% absolute precision.

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

where,
n: required sample size
Pexp: expected prevalence
d: desired absolute precision

Therefore, the estimated sample size was 384 animals. The animals were selected by using simple random sampling method.

Coprological Examination: Faecal samples for parasitological examination was collected directly from the rectum of each sheep and placed into a universal bottle containing 10% formalin and transported to Wolayta Sodo University school of veterinary medicine parasitology laboratory for examination. The samples were clearly labeled with animal's identification, date, sex, age, body condition and place of collection. Sedimentation technique was used to detect the presence or absence of fluke eggs in the fecal sample collected, as described by Antonia *et al.* [20]. To differentiate between eggs of *Paramphistomum* species and *Fasciola* species, a drop of methylene blue solution was used.

Data Analysis: Data were analyzed with a nested design using the Microsoft Excel spead sheet to analyze the relationships between sex, age and body condition. Infection rates based on age, sex and body condition variations in the prevalence of fascioliasis were analyzed by the Pearson's chi-square (x^2) used [21].

RESULTS

In this study, out of the 384 animals examined, 69 (18%) revealed the presence of liver flukes upon coprological examination. The present study revealed that, the prevalence of ovine fasciolosis was proved to be highest in old aged sheep 21.05 % (12/57) and adult 20.89(47/225) sheep when compared to the young aged sheep 9.80% (10/102). Statistical analysis showed that there was significant difference ($P<0.05$) in prevalence of fasciolosis among the three age groups (Table 1).

Among 116 examined male and 268 female sheep 19(16.38%) and 50(18.66%) was positive for fasciolosis upon coprological examination respectively. According to this finding there was no statistically significant variation ($p>0.05$) observed between male and female sheep (Table 2).

The present study also assessed the effect of body condition of sheep on the prevalence of ovine fasciolosis. According to this study high prevalence of ovine fasciolosis was observed in sheep with poor body condition with a prevalence of 36.51% (23/63) followed by sheep with medium body condition with a prevalence of 21.02% (33/157). Among 164 examined sheep with good body condition 13(7.92%) was positive for fasciolosis upon coprological examination. There was statistically significant difference ($p < 0.00$) (Table 3).

DISCUSSION

Fasciolosis, caused by trematode parasites of the genus *Fasciola*, is an economically important disease of sheep and limits productivity of sheep's in tropical and subtropical countries [10]. In sheep, acute fasciolosis most often results in sudden death without other apparent clinical abnormality [22]. The prevalence rate, epidemiology and the species involved vary in locality.

Table 1: Prevalence of ovine Fasciolosis in relation with the age in the study area

Risk factor	Variables	Animals examined	No.of positive	Prevalence (%)	χ^2	P-value
Age	Young	102	10	9.80	6.946	0.031
	Adult	225	47	20.89		
	Old	57	12	21.05		
Total		384	69			

Table 2: Prevalence of ovine Fasciolosis relation with the sex in the study area.

Risk Factors	Variables	Animals examined	No.of positive	Prevalence (%)	χ^2	P-value
Sex	Male	116	19	16.38	0.285	0.594
	Female	268	50	18.66		
Total		384	69			

Table 3: Prevalence of ovine Fasciolosis relation with the body condition in the study area.

Risk Factors	Variables	Animals examined	No.of positive	Prevalence (%)	χ^2	P-value
Body condition	Good	164	13	7.92	26.901	<0.001
	Medium	157	33	21.02		
	Poor	63	23	36.51		
Total		384	69			

One of the most important factors that influence the occurrence of Fasciolosis in an area is availability of a suitable snail habitat. In addition, optimal base temperature levels of 10°C and 16°C are necessary for snail vector of *F. hepatica* and *F. gigantic*, respectively [11].

In this study, out of the 384 animals examined, 69 (18%) revealed the presence of liver flukes upon coprological examination. The finding of the present study strongly disagrees with the findings of Bahiru and Ephrem [23] from Eastern Gojam (63%); Bitew *et al.* [24] from Kemisse (49%); Yilma and Malone [11] from Holeta (49%); Beyazen [25] from Kemisse (49%) and Yadeta [26] from Western Shoa (73%). But the present finding showed higher prevalence of fasciolosis as compared to the finding of Wessise [27] from Nekemte and Ahmed *et al.* [28] from the middle Awash River basin who reported 13.4% and 13.2% respectively. The finding of Gebretsadik *et al.* [29] from Mekelle also disagrees with the finding of the present study who reported 24.44% of fasciolosis in the study area. There is a great difference among the finding of these scholars as compared to the present finding and this variation might be attributed to the difference in the infestation level of the study area, species of animal, ecology of intermediate host, seasons of the study, livestock management and soil property of grazing area and agro-climate of the study area. Prevalence rates and epidemiology of the disease vary significantly with locality and this attributed mainly due to the variation of climate and ecological conditions [30].

The present study statistical analysis of the data showed that the presence of significant difference ($p<0.05$) on the prevalence of fasciolosis on the basis of body condition score. Higher infection with fasciolosis was observed in poor body condition sheep 36.51% (23/63) followed by medium 21.02% (23/157) and good body condition 7.92% (13/164) and lowest prevalence rate of fasciolosis was recorded in good body condition animals which agree with the result of Eyerusalem *et al*. [31] indicated that the prevalace of 45.7% in poor and 32.9% in good body condition from Adigrat area and 51.6%, 37.6% were revealed on the poor and good body condition respectively from western Hareregeh area by Negash and Tesfaheywet [32]. This finding confirms the importance of fasciolosis in causing weight loss and emaciation as a characteristic sign of the disease. Besides, the high prevalence of fasciolosis infection in poor body conditioned animals could be justified by the fact given by Devendra and Marca [33] who indicated animals of poor body condition are vulnerable to parasitic diseases. The significant variation in the prevalence of fasciolosis in relation to body condition could be further justified by the fact that as the body condition improves, infection with fasciolosis decreases body weight because fasciola worms are known to suck blood and tissue fluid and even damage the parenchyma of the liver due to the migrating immature worms indicated by Marquardt *et al*. [34]. Moreover, cholangitis and liver cirrhosis induced in chronic fasciolosis could reduce bile flow to the duodenum and hence reduced lipid emulsification, digestion and absorption of fatty acid and lipid soluble vitamins [35].

The present study indicates that higher infection of fasciolosis was observed in old aged sheep 21.05% (12/57) than adult 20.89% (47/225) and young 9.8% (10/102) age groups.This agree with observation of other scholars from western Hareregeh area with result of old (53.1%) and young (40.1%) and Mathewos *et al*. [36] observed that 32.2% and 20.2% in old and young age sheep respectively from Selected Sub-Districts of Alamata District, Ethiopia. This could be due to the presence of high maternal immunity in young age groups of sheep than old and adult age groups. Josef *et al*. and Pralomkarn *et al*. [37, 38] who reported that the level of immunity, age, nutrition, concurrent infection and genetic effects of the host were important factors for resistance of fasciolosis infection. On the other hand Molalegne *et al.* [39] reported that young animals could not go far with adult for grazing/feeding, so the possibility of being infected by fasciolosis was lower than olds and adults.

The present study was conducted during the dry period of the year when the infections rate of fasciolsis is expected to be low. However, the study done by Dagne [40] concluded that sex has no impact on the infection rate and hence both male and female are equally susceptible and exposed to the disease which was similar finding with present result. The additional fact that prevalence of fasciolosis was not significantly different between male and female sheep may indicate that sex of the animals has no impact on the prevalence because both sexes are allowed to graze and are equally exposed to the infection. Similar observation has been made by Mulualem [41].

Although the present study revealed that a moderate prevalence of ovine fasciolosis in the study site; the prevalence was significantly affected by body condition and age. Higher prevalence of ovine fasciolosis was recorded in poor body condition than both medium and good body condition. In conclusion, the results of the current study suggests that ovine fasciolosis was found to be one of the disease entities in the study area.

Therefore based on the above conclusion the following recommendations are forwarded. The farmers who rear sheep should improve provision of feeds to their animals so that the animal can have good body condition that confers some level of resistance against fasciolosis. Utilization of swampy areas for crop production and strategic deworming. Further epidemiological study on biology and ecology of the intermediate host so as to develop a sustainable planning and implementation on the control strategies of the disease.

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