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Research Article

Prevalence and Associated Risk Factors of Ovine Fasciolosis in Ejere District, West Shewa, Ethiopia

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Abstract

Fasciolosis is one of the most prevalent trematode helminth infections of ruminants in different parts of the world. It causes significant morbidity and mortality. The presence of fasciolosis due to *F.hepatica* and *F.gigantica* in Ethiopia has long been known, and its prevalence and economic significance have been reported by several researchers. However, the disease is insufficiently investigated, and information relating to its magnitude, distribution, and risk factors is scant Ejere district, West Shewa Oromia region of Ethiopia. A cross-sectional study was conducted from May 2021 to June 2022 in the Ejere district with the objective of estimating the prevalence of ovine fasciolosis and assessing the various risk factors associated with it. A total of 196 fecal samples from sheep were collected by using simple random technique and examined. The data was analyzed using SPSS software. Among a total of 196 examined sheep, 41 were found positive for *Fasciola*, with an overall prevalence of 20.92%. The prevalence of fasciolosis recorded in the six kebeles was 5.45%, 14.29%, 7.14%, 16.22%, 5.45%, and 11.94% in Ejere Sokile, Baso, Kimmoyye, Ilu Aga, Kusaye, and Gaba Jimata, respectively. In this study, ovine fasciolosis showed a statistically significant difference in sex, management system, body condition, and history of deworming ($p<0.05$). The difference in age was not statistically significant ($p>0.05$). The current study indicates that fasciolosis is a common and prevalent disease in sheep in the study area. Strategic anthelmintic treatment with appropriate drugs and a reduction in the risk of infection should be upgraded in society.

Keywords: Ejere; Ethiopia; Ovine fasciolosis; Prevalence; Risk factors.

Abbreviations: DACA: Drug Administration and Control Authority; EWAB: Ejere Woreda Agricultural Bureau; FAO: Food and Agricultural Organization of United Nations; SPSS: Statistical Package of Social Sciences; WHO: World Health Organization

Introduction

Ethiopia has an enormous livestock resource, contributing 15% of GDP and 33% of agricultural output [1], and has the largest livestock population in Africa, with an estimated population of 26.1 million sheep [2]. 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 productivity [3].

Sheep play a significant role in maintaining household stability by providing meat, milk, skin, and wool; generating cash income; and playing traditional social and religious roles. Even though Ethiopia is known for its larger animal populations, the animals' performance and their contribution to the national economy are relatively low due to viral, bacterial, and parasitic diseases; improper healthcare; and other management problems [4]. Endo-parasitic infections are known to be the main factors that affect productivity. As previously reported [5], the various species of gastrointestinal and pulmonary nematodes, trematodes, and cestodes are known to be prevalent in Ethiopia.

Fasciolosis is one of the most prevalent trematode helminth

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infections of ruminants in different parts of the world. It causes significant morbidity and mortality. The presence of fasciolosis due to *F.hepatica* and *F.gigantica* in Ethiopia has long been known, and its prevalence and economic significance have been reported by several workers [6]. Areas with seasonally flooded pastures, grazing areas lacking shores, slowly flowing waterways, and banks of rivers are among the most conducive environments for the breeding of snail vectors of fasciolosis [7]. Thus, the two Fasciolid species overlap in many African and Asian countries. Although, in such cases, the ecological requirements of the flukes and their snail intermediate host are distinct [8].

In Ethiopia, the annual losses due to ovine fasciolosis were estimated at 48.4 million Ethiopians 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 [9]. Apart from its great veterinary importance throughout the world, *F. hepatica* has recently been shown to be a re-emerging and widespread zoonotic agent, affecting numerous human populations in the world [10].

The prevalence of fasciolosis in sheep has not been conducted so far in the Ejere Woreda district. In the area, especially in Ilu Aga, Baso, and Gaba Jimata attributes the creation of a favorable environment for the growth and multiplication of snails for intermediate hosts by providing moisture from flooding during the rainy season and from the irrigation schemes during the dry season. However, the disease is insufficiently investigated, and information relating to its magnitude, distribution, and risk factors is scant. Therefore, the present study was undertaken with the general objective to assess the prevalence of ovine fasciolosis in study area and specifically of providing information on the current status of the prevalence of ovine fasciolosis and assessing the various risk factors associated with it in selective kebele of Ejere Woreda, West Shewa, Ethiopia.

Objective

The objective of current study was to identify the Prevalence and associated risk factors of ovine Fasciolosis in Ejere District, West Shewa, Ethiopia.

Materials and Methods

Description of the Study Area

The study was conducted from May 2022 to June 2022 in Ejere district, Western Shewa, Oromia Region of Ethiopia. Ejere is located 44 kilometers west of Addis Ababa at an altitude of 2060–3085 meters above sea level between latitude 9° 9" N and longitude 38° 22" E. The mean annual rainfall is 1075mm; more than 80% of which falls between June and September, and the mean temperature is 26.5°C. The total sheep population of Ejere Woreda is 63,588 [11].

Study Animal

The study animals were sheep of both sexes, different age groups such as young (<2 year) and adults (≥2 year), and different body conditions kept in the Ejere district under an extensive and intensive production system. The age of selected sheep was determined by asking owners and by dentition method.

Study Design

A cross-sectional study was used for this study to assess the prevalence and identify associated risk factors that have contributed to ovine fasciolosis in the Ejere district.

Sample Size Determination and Sampling Technique

As there is no published information on the prevalence of ovine fasciolosis in the Ejere district, the sample size was calculated using formula, which included a 50% expected prevalence, a 7% desirable absolute precision, and a 95% confidence interval.

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

Where n = sample size, P_{exp} = expected prevalence, and d = desired absolute precision. Hence, according to the formula given above, the total sample size was estimated at 196. Study animals were selected from six kebeles. Purposely, six kebeles (three kebeles from swampy areas and three from non-swampy areas) were selected. A simple random technique was used to select the study animal from the population.

Sample Collection, Transportation and Examination

After properly restraining the animal, fecal samples were collected directly from the rectum or from freshly dropped feces using disposable gloves, placed in bottles, reserved, labeled, and transported to the Ejere Woreda type 'B' veterinary clinic laboratory and screened for the presence of fasciola eggs using the sedimentation technique. Identification of the eggs was made based on the morphological keys given by [12] by using a compound microscope with 10x and 40x objectives.

Coprological Examination

Faecal samples were collected directly from the rectum of randomly selected animals and examination carried out in the field as much as possible. The samples were collected in tightly closed universal bottles and examined for presence of Fasciola eggs. Faecal examinations for fluke eggs usually require use of faecal sedimentation. Accordingly, a total of 196 faecal samples were collected and processed.

Sedimentation procedures concentrate both eggs and faeces at the bottom of a liquid medium (water) and help to detect fluke eggs that have too high specific gravity. Therefore, the samples were analyzed using sedimentation procedure to demonstrate liver fluke eggs which are large, golden, and yellow in color. Briefly, about 3 grams of faeces as weighed and 42ml of tap water was poured to it. It was thoroughly mixed with a stirring device. The suspension was then filtered through a tea strainer. The filtered suspension was poured in to test tube which stood in the rack. The test tubes with filtered material was put in centrifuge and centrifuged for three minutes for 1200 rpm. The supernatant was carefully discarded after centrifuged. The resulting sediment was stained by adding two drops of methylene blue and shacked carefully. A small drop of the stained sediment was transferred to a microscope slide using a pipette. Cover slip was put to over the droplet. It was then examined under microscope at 10x objective [13].

Data Analysis

The collected data was first entered and managed in a Microsoft Excel worksheet, and SPSS software version 20 was used for data analysis. A chi-square (χ^2) was used to determine the association between fasciola infestation and risk factors, and a P value of less than 0.05 was considered significant.

Results

Overall Prevalence of Ovine Fasciolosis in Ejere Fistrict

A total of 196 sheep were examined to estimate the prevalence of ovine fasciolosis and associated risk factors that favors fasciola infestation in the Ejere district. Among the examined sheep, 41 were found positive for *Fasciola,* with an overall prevalence of 20.92%.

Prevalence of Ovine Fasciolosis Based on Risk Factors

Prevalence variation exists between origins, the six kebeles in the district, the highest being at Ilu Aga (16.22%) followed by Baso (14.29%) Gaba Jimata (11.94%) which were from swampy area and Kimmooyyee (7.14%) and with symmetric record of Ejere Sokile (5.45%) and Kusaye (5.45%) those from non-swampy locality. This difference in prevalence was statistically significant ($p<0.05$) (Table 1).

The prevalence of fasciolosis in male and female sheep was 13.59% and 29.03%, respectively. There was a statistically significant difference in the prevalence of ovine fasciolosis based on sex ($p<0.05$) as indicated. The influence of age on the prevalence of ovine fasciolosis revealed that there was a higher prevalence rate (20.77%) in adults and a lower prevalence rate in sheep at a young age (21.21%). Although the prevalence was relatively higher in adult sheep, the difference was not statistically significant ($p>0.05$) (Table 1).

The prevalence of ovine fasciolosis in sheep in poor body condition was 28.57%. However, animals with good body conditions showed a prevalence of 15.04. A significant difference ($P<0.05$) was observed in the body condition of the study animals. An attempt was also made to analyze the prevalence with respect to the deworming history of the animals. The prevalence of the disease in animals that were not dewormed (30.65%) was higher than in dewormed (4.17%) sheep. The result of the analysis revealed statistical significance. Additionally, the prevalence rate of infection of fasciolosis was recorded among management systems extensive and intensive as (22.47%) and (5.56%) respectively, which was statistically significant ($p<0.05$) (Table 1).

Table 1: The prevalence of ovine fasciolosis based on intrinsic factors sex, age and body condition and extrinsic factors deworming history and management system in Ejere Woreda.

Risk factors	Total No. examined	No. of affected	Prevalence (%)	Chi-square χ2	P-value
Sex					
Male	103	14	13.59	8.717	0.003
Female	93	27	29.03		
Age					
Young	66	14	21.21	0.4296	0.512
Adult	130	27	20.77		
Body condition					
Poor	83	24	28.57	2.198	0.001
Good	113	17	15.04		
Deworming history					
Non dewormed	124	38	30.65	3.201	0.011
Dewormed	72	3	4.17		
Management system					
Intensive	18	1	5.56	0.293	0.002
Extensive	178	40	22.47		
Origin					
Non swampy					
Ejere Sokile	25	3	5.45		
Kusaye	28	3	5.45		
Kimmooyyee	29	4	7.14	25.5	0. 015
Swampy					
Ilu Aga	39	12	16.22		
Baso	41	11	14.29		
Gaba Jimata	34	8	11.94		
Total	**196**	**41**	**20.92**		

Discussion

The present study was designed to assess the prevalence and identify risk factors associated with ovine fasciolosis. It revealed that the overall prevalence of ovine fasciolosis based on the coprological investigation was 20.92%. Our finding nearly agrees with previous studies by [14], who reported the prevalence as 26.56% in and around Holeta. This may be due to the similarity of the climatic conditions and geographical regions, such as rainfall, altitude, temperature, and humidity. The current prevalence of ovine fasciolosis was higher than the previous work by, who reported 13.2% in the middle Awash River basin. The reason might be due to the differences in temperature, moisture, humidity, altitude, and soil that might favour the multiplication of intermediate hosts, snails. The difference in prevalence and severity of the disease syndrome is evident in various geographical regions depending on the local climatic conditions, availability of permanent water, and system of management [12]. The marshy area by the Berga River in the swampy study area combined with the construction of multiple micro dams from this river might be another important factor for the perpetuation of the intermediate host. Moreover, most of the plain land of the area contains pockets of water-logged marshy areas, which provide suitable habitats year-round for the snail intermediate hosts [11].

Prevalence of fasciolosis based on origins in the different kebeles of the study areas was revealed statistical difference ($p< 0.05$). It might be due to the altitude and other ecological conditions. Where, [15] suggested altitude be one of the determinant factors for the difference in the distribution of fasciolosis. Prevalence of fasciolosis with regard to sex was 13.59% and 29.03% in male and female animals respectively. The difference was indicated statistically significant ($p<0.05$) that the prevalence of fasciolosis was significantly different between male and female sheep may indicate that male sheep were lower in prevalence because in the area male sheep were dewormed regularly and tethered around the home for fattening purposes to sales them; thereby access of infection will be lower compared to females. This idea was disagreed with [14] who recorded 32.24% in males and 22.84 in females. This study agreed with the study reported by [16] which is the prevalence of the disease in female and male animals was recorded as 36.6% and 34.6%, respectively.

The present study indicated that the infection rate of fasciolosis was not significant by age; hence ($P>0.05$), it was higher in young sheep than in adult sheep. This was not in consent with [17]. Furthermore, differences in prevalence were statistically significant (P 0.05) in sheep with poor body condition compared to animals in good body condition. [18] also reported a significantly higher prevalence in sheep with poor body conditions than in those with good body conditions. This signified the importance of fasciolosis in causing weight loss and this could be due to the fact that animals with poor body conditions are usually less resistant and are therefore susceptible to infectious diseases [19].

Evaluation of infection prevalence in dewormed and non dewormed sheep revealed significantly that the non-dewormed sheep were found to be more susceptible to fasciolosis than dewormed sheep. This could be due to effective anthelmintics reducing the worm burden. However, re-infection was observed among dewormed sheep groups due to the presence of irrigation canals and very large marsh areas used for grazing [20]. In the study area, almost all sheep are not dewormed, especially

when strategic treatments are not implemented at appropriate timing and with the aim of reducing the worm burden from infected animals and preventing pasture contamination.

Periodic anthelmintic treatment is the most commonly used means to control the diverse effects of Fasciolosis in ruminants. It is recommended that twice-yearly treatment under smallholder farmers' situation is an effective and affordable regime under tropical [21,15]. The first treatment is recommended to be given during the dry season to eliminate the adult parasite. Such a treatment enables the animals to survive the effects of the dry season when nutritional conditions are generally compressed. It also avoids contamination with fluke eggs of water holes and irrigation channels. On the other hand that late December might be a more appropriate month to administer the treatment to sheep in the study area concerned, where the rainy season sometimes extends into October since animals treated before mid-December are liable to significant re-infection. The second treatment has been given early wet season when the immature flukes migrate through the hepatic parenchyma. Strategic anthelmintic treatment helps to reduce grazing land contamination with fluke eggs and increases productivity [21,15]. But in the study area sheep will not be dewormed according to the afore mentioned deworming calendar.

The prevalence of ovine fasciolosis associated with the management system was found to be statistically significant (P>0.05) with extensive 22.47% and intensive 5.56%. This study agrees with those [22,14] who observed that a well-fed animal was not in trouble with worms and that a poor diet usually resulted in more helminth infections. Furthermore, helminths also led to a loss of appetite and poor utilization of food, which resulted in a loss of body weight. It was demonstrated that weekly growth rates of wool and live weight decreased with increasing fluke burdens in sheep.

Conclusions and Recommendations

Even though our study was aggressively limited by time to collect all the samples necessary and screen them in the lab for fasciolosis, we got the great achievement on coproscopy that fasciolosis was a prevalent sheep disease in the study area that could potentially hinder the productivity of sheep and tremendously affect the rural economy at large, though it does not get consideration. In this study, (origin, sex, body condition, management system, and deworming history were the most important risk factors for fasciolosis. However, it is increasingly evident that a proper evaluation of the epidemiology of this trematode disease is lacking. The prevalence reported in this study has clearly indicated a lack of strategic control measures against the diseases and is also due to the wide marsh areas at the grazing sites of the animals. This prevalence found in the study area could also be due to the water lodgement from the Berga River, which increased irrigated land masses and ponds at grazing areas for animals, and the tendency of farmers to graze their animals in these areas because of feed scarcity. Based on the afore mentioned conclusion, the following recommendations are forwarded:

- An integrated approach, which is a combination of selective chemotherapy and selective vector control, should be considered more practically and economically feasible.

- Strategic anthelmintic treatment with appropriate fluckcidal drugs should be practiced to eliminate the fluke burden of the host and minimize the pasture contamination by fecal egg shedding, thus interrupting the life cycle.

- Supplementation of important nutrient feed in the dry season is important to avoid stress conditions that affect the host's resistance and susceptibility to parasitic diseases.

- Reduction in the risk of infection by planned grazing management

- Training needs to be organized for farmers with economic significance.

- Reduction in the risk of infection by planned grazing management

- Training needs to be organized for farmers with economic significance and control methods for this disease in the study area.

Detailed studies should be conducted on the epidemiology of the disease in order to expand and implement disease investigation and control strategies.

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