JSM Veterinary Medicine and Research

Research Article

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Prevalence of Ovine Fasciolosis and Its Economic Loss In and Around Ambo, Ethiopia

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Abstract

A cross sectional study was conducted from October 2017 to March 2018 with the objectives of determining the prevalence and economic importance of ovine fasciolosis in Ambo restaurant. Coprological and postmortem examinations were employed to determine the sensitivity. Out of the total 384 adult sheep slaughtered at Ambo restaurant during the study period, 151 animals (39.3%) were found to be affected by Fasciolosis. The overall prevalence of Fasciolosis in Ginchi, Ambo and Guder origin were 40.8%, 39.6%, and 38.2% respectively. Prevalence of fasciolosis on poor, good, and medium body condition animals were 66.0%, 20.5%, and42.5% respectively. A significant difference ($P < 0.05$) in prevalence was observed among body condition of the study animals. Post mortem examination was more sensitive than coprological examination for diagnosis of fasciolosis with a kappa value of 0.55. The direct and indirect losses incurred due to Fasciolosis in Ambo restaurant were estimated about 72,277ETB. In conclusion, further studies should be conducted to determine the prevalence of Fasciola species infecting ovine and associated risk factors of the diseases in the study area.

Keywords: Ambo; Economic Loss; Fasciolosis; Ovine; Restaurant

Introduction

Ethiopia possesses the largest livestock population in Africa, 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 [1]. Regardless the large size of the sheep population in the country and the huge potential therein; the productivity per animal and the contribution of this sub-sectors to the national economy is relatively low due to multitude constraining factors including malnutrition, disease improper health care and other management problems [2]. Health disorders in all classes of small ruminants represent the major problems and greatly affect the economics of sheep and goat production. Parasites constitute a major constraint in livestock production systems, particularly in sheep and goats. Infections by helminths are the single greatest constraint to sheep and goat production in the tropics particularly where nutrition and sanitation are poor [3]. It is estimated that in Ethiopia two million cattle and 5-7 million sheep and goats die from diseases each year. Production losses to the livestock industry from these diseases are estimated at more than 900 million birrs annually [4].

Fasciolosis, caused by *F.hepatica* and *F.gigantica* is one of the most prevalent helminth infections of ruminants in different parts of the world.It causes significant morbidity and mortality.

Submitted: 29 January 2019 | **Accepted:** 08 February 2019 | **Published:** 10 February 2019

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Citation: Chala D, Alemu B (2019) Prevalence of Ovine Fasciolosis and Its Economic Loss In and Around Ambo, Ethiopia. JSM Vet Med Res 1: 5.

Both the highland (*F. hepatica*) and the low land (*F.gigantica*) types of liver flukes cause severe losses in many parts of Ethiopia where suitable ecological conditions for the growth and multiplication of intermediate host snails are found. Areas with seasonally flooded postures, grazing is as of lakeshore, slowly flowing waterways, and banks of rivers are among the conducive environment for breeding of snails' vectors of fasciolosis. This snail born trematode infection is one of the major diseases contributing to the loss in productivity of the livestock industry in Ethiopia [5,6].

Fasciolosis occurs commonly as a chronic disease in cattle and severity sometimes depends on the nutritional status of the host. It causes a substantial economic loss which includes death, loss in carcass weight, reduction in milk yield, condemnation of affected livers, the decline in production and reproductive performances, predisposes animals to other diseases and cost of treatment expenses [7]. Fasciolosis in ruminants ranges in severity from a devastating highly fatal disease in sheep to asymptomatic infections in cattle.The severity of pathological manifestations usually depends on the number of metacercariae ingested over a period of time and the relative susceptibility of the animal [8]. Fasciola parasites develop into adult flukes in the bile ducts of infected mammals, which pass immature Fasciola eggs in their feces. The next part of the life cycle occurs in freshwater. After several weeks, the eggs hatch, producing a parasite form known as the miracidium, which then infects a snail host. Under optimal conditions, the development process in the snail may be completed in 5 to 7 weeks; cercariae are then shed in the water around the snail. The cercariae lose their tails when they encyst as metacercariae (infective larvae) on water plants. In contrast to cercariae, metacercariae have a hard outer cyst wall and can survive for prolonged periods in wet environments [9]. Fasciolosis have public importance wheninfectious metacercariae are ingested with contaminated water or raw or undercooked vegetables. During their larval stage, immature flukes migrate through the liver producing an acute febrile syndrome some

weeks after infection, followed by a chronic-latent stage which may last for years or decades. Acute fasciolosis is characterized by fever, high eosinophilia and hepatosplenomegaly. At this stage, ova are usually not yet produced [10]. The epidemiology of fasciolosis depends on the grazing habitat preference of the animal. Metacercaria can survive up to 3 months after harvesting in hay from endemic highland areas that are consumed by the ruminants in arid and lowland areas, particularly during the dry season when suitable grazing pastures are scarce; local crowding of animals along the banks of streams and ponds during the dry season [11]. The (re)emergence of fasciolosis in certain countries can be explained by the recent evolution of human activities, such as the building of irrigation systems, livestock management, the use of unsafe water, and raw vegetable consumption [12].

Diagnosis of Fasciolosis is primarily based on the clinical sign, seasonal occurrence, and privies history of the disease on the herd or the identification of snail habitats, postmortem examination, hematological tests and examination of feces for fluke eggs. Even though it is difficult to detect Fasciola in live animals, liver condemnation at slaughter or necropsy was found to be the most direct, reliable, and cost-efficient technique for the diagnosis of fasciolosis [13]. The control of Fasciola in sheep and cattle is achieved through a combination of the snail and the treatment of the infected animal [14]. Integrated control seems to be the most effective solution for controlling fasciolosis, because it enables monitoring, prevention, and rapid action in case of the (re)emergence of the disease [12]. In Ethiopia, the annual losses due to ovine fascioliasis 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 [15]. Therefore, the objectives of this study were to determine the prevalence of ovine fasciolosis and to asses' associated economic loss in and around Ambo.

Material and Methods

Description of study area

The study was conductedfrom October 2017 to March 2018 in Oromia region west of Addis Ababa at Ambo town. Ambo has located 114km from Addis Ababa. The altitude of the town ranges from 1872-2362 meters above sea level. The mean annual maximum and minimum temperature of the town are 18.87^0cand 23.7^0c respectively. This is a characteristic of a warm temperate climate which is locally called *weinadega*. The soil type encountered in Ambo and its surrounding includes black clay and red clay. The livestock population of the woreda is estimated about 37,883bull, 48,305cows, 653525 sheep, 29860 goats and 90134 chickens [16].

Study animals and sample size

The study animals were the local breed sheep which originated from Ginchi, Ambo, and Guder areas.The sample size for the study was determined Using the Thrusfield [17] with a 95% confidence interval (CI) and 5% absolute level of precision as follows:

$$N = (1.962\ Pexp)\ (1\text{-}Pexp)/d2$$

Where, Pexp = expected prevalence, d = absolute precision, N = sample size.

Since there was no study conducted in the current study area on small ruminant fasciolosis, 50% expected prevalence was taken and the sample size was calculated to be 384 local breed sheep.

Study Design

A cross-sectional study was conducted on randomly selected indigenous breeds of ovine slaughtered at Ambo restaurant. The data was collected based on their sex, age, body condition, and origin information of sheep and Systematic simple random sampling method was conducted to collect the fresh fecal samples of sheep populationin the study area.

Study Methodology

Fecal samples were collected from sheep byusing disposable plastic gloves and placed in clean screw capped universal bottle. Each sample was clearly labeled with an animal identification number, place of collection, body condition score, sex, and age. The samples were presented with 10% formalin solution to avoid the eggs developing and hatching and then collected sample transported to Ambo veterinary laboratory for examination of Fasciola egg. In the laboratory, coprological examinations were performed to detect the presence of Fasciola eggs using standard sedimentation techniques [8]. After slaughter, the ovine livers were examined usually by palpation of the entire organ and followed by transverse incision on the liver across the thin left lob in order to confirm the presence of liver fluke. The sensitivity and specificity of the direct sedimentation technique were calculated by using the numbers of positive and negative tests in animals with and without flukes in their livers. The degree of agreement between the two methods of liver fluke diagnosis also was determined by using Kappa statistic. The kappa value was interpreted as: slight agreement ($k < 0.2$); fair agreement ($k = 0.2$ - 0.4); moderate agreement ($k = 0.4$ - 0.6); substantial agreement ($k = 0.6$ to 0.8); and almost perfect agreement ($k > 0.8$) [18].

Economic Loss Analysis

The total annual financial loss incurred at the study areawas computed by the direct annual loss of slaughtered sheep liver and carcass in the restaurant.The total quantity of all costs was considered according to Ethiopian currency in birr. The direct financial losses incurred due to liver condemnation were calculated by using an average number of sheep slaughtered annually in Ambo restaurant (5400 sheep's) and mean price of the liver in the town (20birr) by using the formula indicated by GebreIzgabe her [19]. $EL = [S_{SR} \times OC_{Li} \times R_{Li}]$ Where: EL=Estimated annual economic loss due to liver Condemnation, SSR=Annual sheep slaughter rate of the restaurant (5400), OC_{LI}=Average cost of liver/cost of rejected liver (20 birr), R_{Li}= Rejection rate of liver (39.3%). The economic losses due to carcass weight loss were also estimated by using 10% Carcass weight loss from fasciolosis in slaughtered sheep. The annual Carcass weight loss due to fasciolosis in sheep was assessed using the formula given by Ogurinade and Ogunrinade [20] ACW= CSR* CL* BCP where:ACW = Annual loss from carcass weight loss, CSR = Average number of Sheep slaughtered per

year at Ambo restaurant (5400), CL = 10% Carcass weight loss in sheep due to fasciolosis, BC = Average price of 1kg of mutton in Ambo (150 birr) and P = Prevalence rate of fasciolosis at Ambo restaurants (39.3%).

Statistical Analysis

Data generated from the study was entered and managed in Microsoft Excel worksheet and analysis was conducted using SPSS version [20,21]. All raw data coded by numerical values were subjected to chai value(x^2) and p-value tests to determine statically significance variations in the prevalence of ovine fasciolosis between origins, sex and body condition score of sheep's. A 95% confidence interval was used to determine whether there is a significant difference between measured parameters or not as described by Thrus field [17].

Results

Out of the total 384 adult sheep slaughtered at Ambo restaurant during the study period, 151 animals (39.3%) were found to be infected with Fasciolosis. Variation in prevalence was observed among the poor, medium and good body condition scores with a rate of 66.0%, 42.5%, and 20.5% respectively. As the finding shows, the prevalence of Fasciolosis was found to be higher in sheep with poor body condition than those with good body condition and medium body condition score.There was statistically significant difference within a rate of infection and body condition (P=0.000). The sex-basedprevalence of Fasciolosis in male and female sheep were 40.5% and 29.3% respectively. As the finding shows, male sheep were affected witha higher rate than the female. The difference in infection rate within the sex was not statistically significant (p>0.05). Prevalence of fasciolosis on the bases of animal's origin in Ginchi, Ambo, and Guder areas were 40.8%, 39.6%, and 38.2% respectively. The sheep from all areas included in the study were affected by almost with similar infection rate. Furthermore, the sheep from Ginchi showed slightly higher infection rate than Ambo and Guder. The difference was not statistically significant (p>0.05) (Table 1). The sensitivity and specificity of the direct sedimentation technique were calculated from the results in Table 2 which sets out the numbers of positive and negative tests in animals with and without flukes in their livers. From 200 fecal and post mortem examined 165 found flukes in the livers, but only 35 revealed Fasciola eggs in their feces. The sensitivity was 49.3% and specificity was 100%. So the degree of agreement between post mortem examination and fecal examination results was moderate (K = 0.55) (Table 2).

Economic Losses Assessment

In the current study, a total of 151 positive livers were condemned due to fasciolosis. The total annual financial loss incurred due to liver condemnation at the restaurant was computed by multiplying the average number of sheep slaughtered annually in the restaurant with the prevalence of fasciolosis obtained from the present finding and mean price of the liver in the town. An average number of sheep slaughtered annually in Ambo restaurant (5400), a prevalence of fasciolosis obtained from the present survey (39.3%), mean price of the liver in the town (20birr) were used. So the economic loss due to liver condemnation was calculated to be 42444 ETB annually due to ovine fasciolosis. The annual Carcass weight loss due to fasciolosis in sheep was 31,833 ETB. The overall economic losses due to carcass weight loss and liver condemnation by fasciolosis were 74,277 ETB.

Discussion

Out of slaughtered sheep 384 in the Ambo restaurant, the prevalence of Fasciolosis obtained was 39.3% (151/384). The current finding was higher thana previous finding of Ahmed *et al.*[22], who reported 13.2% in the middle Awash River basin. However, it is much lower than the findingof Michael [23] who reported the prevalence of 51% inZeit and Yilma [24] who found 49% in Holeta. The finding showed prevalence of 40.8% in Ginchi, 39.6% inAmbo, and 38.2% in Guder in the basis of study animal's origin.These finding were lower than the finding of Tesfaheywet and Negash [25] in western Hararghe, Molalegne *et al.* [26], in Kemisse, and Yadeta [27] in western Shoa who reported the fasciolosis infection rate of 45.6%, 49%, and 73% respectively. The lower prevalence rate recorded might be due to the increasing awareness of the sheep owners about the need of using anthelmintic drugs to treat fasciolosis, expansion of veterinary clinics at different parts of the study area, existence of private veterinary drug shop at the study area and some ecological change which cause the destruction of suitable environment which is used for the multiplication of intermediate host. The prevalence of Fasciolosis not showed significant variation among the three areas included in the current study that might bedue to the ecology such as the same landscape, temperature, moisture, humidity and soil that favor multiplication of intermediate host, snails assuggested by Urquhart *et al.* [13].

Prevalence of Fasciolosis in female and male animals was 29.3% and 40.5% respectively. The current finding disagrees with the report of Solomon [28] who suggested that Fasciolosis equally affect both sexes. However, there was no significant difference (P > 0.05) observed between sexes that agree with the report of Molalegne *et al.* [26]. Prevalence of Fasciolosis on poor, good and medium body condition animals were66.0%, 20.5%, and 42.5% respectively. The present findings in body condition scores were in slight disagreement with the report of Molalegne *et al.* [26], Ahmed *et al.* [22], Henok and Mekonnen[29], Yemisrach and Mekonnen[30]who reported 73.7% in poor and 38.5% in medium body condition of sheep, 19.5% in poor and 2.8% in medium body condition scores, 16.45% in poor and 2.3% in medium scores, and 20.5% in poor, 14.3% in medium body condition categories respectively. This study showed a significant difference (P < 0.05) in prevalence among the body condition of the study animals that was in agreement with the finding of Molalegne *et al.* [26] and Ibrahim *et al.*[31].

In the current study area, an annual estimated loss due to liver condemnation was 42444 ETB and the annual Carcass weight loss due to Fasciolosis in sheep was 31,833 ETB. The overall economic losses due to carcass weight loss and liver condemnation by ovine Fasciolosis were 74,277 ETB.The present finding was higher than the finding of Berhe *et al.*[32] who reported an annual loss of 25230 ETB from Dessie, northern Ethiopia but lower than an annual loss of 106,536.9 ETB reported from Nekemte by Nebiyu *et al.*[33].

Conclusion and Recommendations

The present finding confirmed that ovine Fasciolosis is one of the parasitic diseases which affect sheep that slaughtered in the current study area. The investigated prevalence of Fasciolosis in sheep slaughtered in Ambo restaurant was about 39.3%.The prevalence of ovine fasciolosis was not associated with sex and originWhile,it was highly associated with body condition scores. The percentage of positive samples by post mortem for fasciolosis was higher than by coprological method for detecting Fasciola in sheep fecal and liver samples, indicating post mortem examination as a more sensitive technique.The overall economic losses due to ovine Fasciolosis in Ambo restaurant was 72277ETB.Recent evolution of human activities, such as the building of irrigation systems, livestock management, the use of unsafe water, and raw vegetable consumption might be the factors for (re) emergence of fasciolosis.Furthermore, destruction of intermediate host (snail population) is required in order to overcome the problems of ovine fasciolosis at the study area.Therefore, based on the current studies implication,the following recommendations are forwarded:

- Periodic anthelmintic treatment should be given to get the maximum benefits from sheep.
- Further studies are necessary to determine the prevalence of Fasciola species infecting ovine and associated risk factors of the diseases.
- Strategic deworming has to be conducted in the study area to minimize the prevalence of parasitic disease.

Acknowledgment

We would like to thank Ambo restaurant staff for valuable cooperation during data collection.

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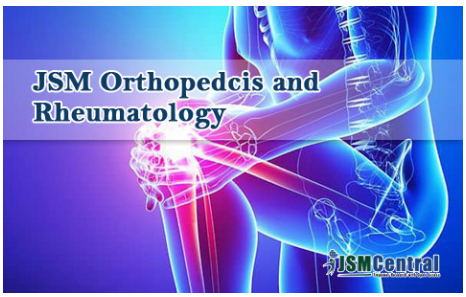

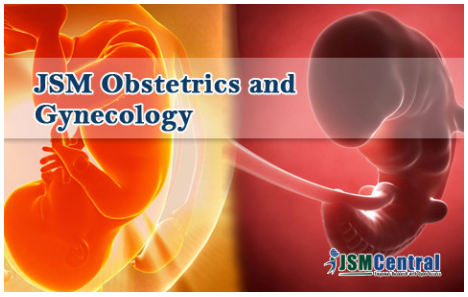

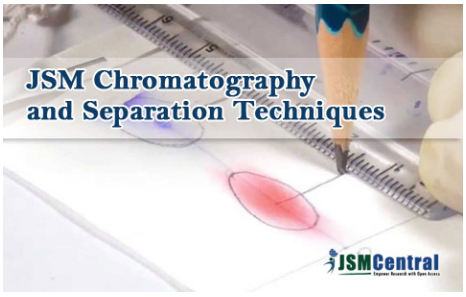

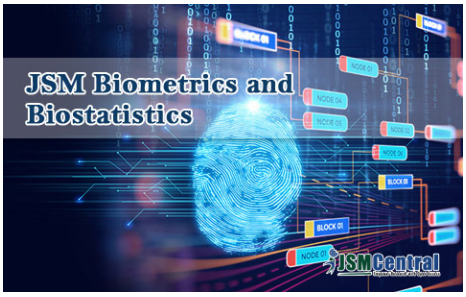

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