

Full Length Research Paper

Prevalence, gross pathological lesions and economic losses of bovine fasciolosis at Jimma Municipal Abattoir, Ethiopia

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This study reports the prevalence of fasciolosis in slaughtered cattle at abattoirs of Ethiopia. A total of 761 cattle were randomly sampled and examined after slaughter of which 407 (53.48%) were positive for fasciolosis. Depending on the degree of pathological lesions, 110 (27.03%), 220 (54.05%), and 77 (18.92%), were lightly, moderately and severely affected respectively. There was a statistically significant association ($P < 0.05$) between the degree of pathological lesion and number of flukes in the liver were 91, 73 and 18 mean number of flukes in moderately, severely and lightly affected livers. The result indicated *Fasciola hepatica* was more prevalent (45.20%) followed by *Fasciola gigantica* (26.54%); mixed infection (15.72%) and unidentified or immature fluke (12.53%). Statistically significant variation was also observed in the prevalence of fasciolosis among animals with poor (73.83%), medium (49.51%) and good (51.24%) body conditions ($P < 0.05$). Coprological examinations on the 163 selected cattle at ante-mortem examination showed the prevalence rate of 8.94%. The total economic loss as a result of *fasciola* infestation was 3,003,488.1408 ETB equivalents. This study suggests that there was significant economic loss due to fasciolosis and warrant immediate attention.

Key words: Abattoir, bovine, fasciolosis, Ethiopia, prevalence, gross pathological lesion.

INTRODUCTION

Bovine fasciolosis is an economically important parasitic disease of cattle in tropical and subtropical countries that limit productivity of animals and caused by fasciolidae, which are trematode of the genus *Fasciola*. The two most important species of this genus are *Fasciola hepatica* and *Fasciola gigantica* (Urquhart et al., 1996). Both *F. hepatica* and *F. gigantica* are transmitted by the snails of the family Lymnaeidae. Infestation with fasciolosis is usually associated with grazing wet land and drinking from the snail infesting watering places (Payne, 1990).

The development of infection in definitive host is divided into two phases; migratory phase and the biliary phase (Dubinsky, 1993). The parenchyma phase begins when encysted juvenile flukes penetrate the intestinal

wall. After the penetration of the intestine, flukes migrate within the abdominal cavity and penetrate the liver or other organs and cause lesion. *F. hepatica* has a strong predilection for the tissues of the liver and cause severe intensity of liver lesion, second phase (the biliary phase) begins when parasites enter the biliary ducts of the liver and flukes mature, feed on blood, and produce eggs. (Behm and Sangsten, 1999).

A tentative diagnosis of fasciolosis may be established based on prior knowledge of epidemiology of the disease in a given environment, observation of clinical sign, information on grazing history, seasonal occurrence, and identification of snail habitats. Confirmatory diagnosis however, is based on demonstration of *Fasciola* spp. eggs through standard examination of feces in the laboratory, post mortem examination of infected animals. Even though it is impossible to detect *Fasciola* in live animals, liver examination at slaughter or necropsy was found to

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be the most direct, reliable, and cost effective technique for the diagnosis of fasciolosis (Urquhart et al., 1996).

The epidemiology of fasciolosis depends on the grazing habitat preference of the animal. metacercariae can survive up to 3 months after harvesting in hay from endemic high land areas that are consumed by ruminants in arid and low land areas (Njau and Scholten, 1991). The economic losses due to fasciolosis through associated with mortality, morbidity, reduced growth rate, condemnation of fluke liver, increased susceptibility to secondary infections and expense due to control measures (Malone et al., 1998). Keeping in view the above facts and the importance if disease in mind the study was planned with the following major objectives:

- 1) To determine the prevalence rate of bovine fasciolosis, by post mortem and coprological examination.
- 2) To compare the intensity of the infection with the liver lesion
- 3) To identify the commonly involved fluke species
- 4) To determine the direct and the indirect economic losses due to the disease.

MATERIALS AND METHODS

Study area

The study was carried out at Jimma municipal abattoir from November 2010 to March 2011, South West part of Ethiopia, at latitude of about 7°13'- 8°56'N and longitude of about 35°52'-37°37'E, and the elevation ranging from 880 to 336 0m above sea level. The study area receives a mean annual rain fall of about 1530 mm which comes from the long and short rainy seasons. The annual mean minimum and maximum temperature is 14.4 and 26.7°C respectively (NMSA, 2010).

Study population

The study animals comprised male indigenous zebu cattle presented for slaughter from different localities in the Jimma Municipal Abattoir. A total of 761 cattle were selected based on systematic random sampling and examined following ante-mortem and post mortem inspection procedure.

Sample size determination and sampling strategy

Systematic random sampling method was employed to generate data for the study at the abattoir on cattle presented for slaughter. Thus, taking 50% expected prevalence the sample size used for the present study was calculated according to the method described by Thrusfield (1995) as follows:

$$n = 1.96^2 P_{exp} (1-P_{exp}) / d^2$$

Where n= the sample size, P_{exp} = the expected prevalence= 47, d= the desired absolute precision= 5%.

Accordingly, the estimated sample size was 384 animals, to increase the precision, 761 male cattle were included in the study.

Ante-mortem Inspection

Each animal was identified based on the enumerate marks on its body tagged before slaughter and assessment of body condition was carried out using a modified method described by (Nicholson and Butterworth, 1986). Attention was given to the factors such as age, body condition and origin of the animals to determine the impact of these factors on the disease picture, however; almost all cattle presented for slaughter were local breed and males.

Post mortem examination

Fasciola species identification

Palpation and incision was made on each liver and bile duct to examine flukes. Then these were collected in universal bottles to identify the involved *Fasciola* species. Species identification of the recovered *Fasciola* was performed (based on the morphological feature of the agents) and classified into *F. hepatica*, *F. gigantica*, mixed and immature or unidentified forms of liver fluke (Urquhart et al., 1996; Soulsby, 1982).

Economic loss assessment

The direct annual loss from liver condemnation was assessed by considering the overall prevalence rate of the disease, the total annually slaughtered animals in the abattoir and the retail market price of an average zebu liver. Annual slaughtered rate was estimated from retrospective abattoir records of the last years, while retail market price of an average size zebu liver was determined from the butcheries in Jimma town. The information was subjected to mathematical computation using the formula set by Ogunrinade and Ogunrinade (1980).

$$ALC = MCS * MLC * P$$

Where ALC=Annual loss from liver condemnation, MCS= Mean annual cattle slaughtered at Jimma abattoir, MLC= Mean cost of one liver in Jimma town, P= Prevalence rate of the disease at the study abattoir.

On the other hand, the indirect economic loss was associated with carcass weight reduction due to fasciolosis. A 10% carcass weight loss due to fasciolosis in cattle was reported by Robertson (1976). Average carcass weight of an Ethiopian zebu was taken as 126 kg (ILCA, 1992). The annual economic loss because of carcass weight reduction due to bovine fasciolosis was assessed using the formula set by Ogunrinade and Ogunrinade, (1980).

$$(ACW) = CSR * CL * BC * P * 126 \text{ kg}$$

Where ACW= Annual loss from carcass weight reduction, CSR= Average number of cattle slaughtered per annum at study abattoir, CL= Percentage of carcass reduction, BC= An average price of 1 kg beef in Jimma town, P= Prevalence rate of Fasciolosis at Jimma abattoir, 126 kg= Average carcass weight of Ethiopian zebu.

RESULTS

Prevalence rate of fasciolosis

The prevalence of bovine fasciolosis was found to be 73.83, 49.51 and 51.24% for poor, medium and good

Table 1. Prevalence of bovine fasciolosis in different body condition animals.

Body condition score	Number of cattle examined	Number of positive cases	Number of negative cases	Infection rate (%)
Poor	107	79	28	73.83
Medium	412	204	208	49.51
Good	242	124	118	51.24
Total	761	407	354	53.48

Pearson Chi² (2) =20.9062, P-Value = 0.000.

Table 2. Species of *Fasciola* encountered in affected livers.

Species of <i>Fasciola</i>	Number of livers	Percentage
<i>F.hepatica</i>	184	45.20
<i>F.gigantica</i>	108	26.54
Mixed infection	64	15.72
Immature fluke	51	12.53
Total	407	100.00

Pearson Chi² (4) = 741.1400, P-Value = 0.000.

body condition score respectively (Table 1) which was statistically significant ($P < 0.05$) indicating body condition was inversely related to infestation rate. Of a total 407 infested livers, *F. hepatica* was the most commonly encountered parasite with prevalence rate of 44.96% while *F. gigantica* 26.54%, mixed infestation 15.72% and immature flukes 12.53% (Table 2) with statistically significant different.

Based on the degree of pathological lesions observed 110 (27.03%), 220 (54.05%) and 77 (18.94%) livers were lightly, moderately and severely affected, respectively (Table 3). The variation in intensity of infestation between the three lesion categories was statistically significant

($P = 0.000$). The fluke burden versus the severity of pathological lesions on the liver indicated that there is no direct relationship between the numbers of flukes recovered since the mean number of flukes found in moderately affected livers was higher (91) than the mean number of flukes in either severely (73) or lightly affected liver (23) (Table 4). Age and origin wise infestation rate were not statistically significant this is due to animals slaughtered were under the same age group and originate nearly from the same area Table 5. Out of the 163 cattle selected for coprological examination 68 were positive for fasciolosis with over all prevalence rates of 8.94%. There is no marked monthly variation in

Fasciola egg finding in which the highest (10.81%) in November and the lowest (7.48%) during March was found (Table 2).

Economic loss analysis

The direct economic loss results from liver condemnation as the result of fasciolosis. The average annual cattle slaughtered was estimated to be 12,316 ETB, while the mean retail price of bovine liver in Jimma town was 15 ETB and the prevalence of fasciolosis in Jimma municipal abattoir was estimated to be 53.48%, therefore, the estimated annual loss from organ

Table 3. Intensity of liver lesion affected by fasciolosis.

Severity of infection	Number of livers infected	Percentage
Light	110	27.03
Moderate	220	54.05
Sever	77	18.94
Total	407	100.00

Pearson χ^2 (3) = 737.2344, P -Value = 0.000.

Table 4. Lesion classification of livers with their respective average fluke burden.

Pathological lesions of liver	Number of livers affected	Average fluke burden
Lightly affected	18	23
Moderately affected	54	91
Severely affected	57	73
Total	129	187
Mean	43	62

Table 5. Prevalence of bovine fasciolosis based on the origin of the animals.

Origin	Number of cattle examined	Number of positive cases	Number of negative cases	Prevalence (%)
Asendabo	179	101	78	56.42
Seka	206	106	100	51.46
Serbo	176	82	94	46.59
Shebe	200	118	82	59.00
Total	761	407	354	53.48

Pearson χ^2 (3) = 6.7699 P -Value = 0.080.

condemnation is = 98,798.952.00 ETB and the indirect economic loss is due to carcass weight reduction as a result of fasciolosis infestation was = 2,904,689.1888.00 ETB 164106.73 USD since price of carcass weight reduction (indirect) loss of 1 kg beef was 35 ETB. Therefore, the total annual economic loss due to bovine fasciolosis in the study abattoir is the summation of the losses from organ condemnation (direct loss) and carcass weight reduction (indirect loss) with a total of 3,003,488.1408 ETB equivalents.

DISCUSSION

The result of the present study indicated 53.48% of fasciolosis prevalence which was relatively higher as compared with the study previously conducted by Tadele and Worku (2007) that reported 46.58% of prevalence rate in the same study area. The reason of increased prevalence of the disease could be due to increase irrigated land masses from the currently constructed

damps and ponds and the tendency of farmers to feed their animals in these marshy and damp areas because of feed scarcity. On the other hand, present study shows lesser prevalence as compared with the previous reports in different parts of Ethiopia (Adem, 1994) in Ziway (56.8%) and Muluaem (1998) in South Gondar (83.08%).

Fecal examination conducted on 163 cattle during ante-mortem examination revealed that 8.94% of the animals were positive for fasciolosis. The relatively higher prevalence rate was analyzed during November, when the wet ecological conditions still prevailed. This is due to breeding of the *Lymnaea* snails and development of the intramolluscan stages of the flukes often reaches the optimal threshold during the wet months of the year.

In Ethiopia *F. hepatica* and *F. gigantica* infestations occur in areas above 1800 masland below 1200 m.a.s.l, respectively which has been attributed to variations in the climatic and ecological conditions such as altitude, rainfall, temperature and livestock management system (Yilma and Malone, 1998). But the present study does not indicate significant variation in origin this is due to

animals brought nearly from the same agro ecological zone.

In relation to body condition of the animals, the prevalence was higher in those animals with poor body condition than in those with medium and good body conditions 73.85, 49.51 and 51.24% respectively. This finding corresponds with the reports of Hagos (2007). The prevalence reported by these workers was 37.7, 33.1, and 29.1% in poor, medium and good body condition animals. This is due to the fact that animals with poor body condition are usually less resistant and are consequently susceptible to infectious diseases.

Species identification revealed that *F. hepatica* was more prevalent (45.20%) as compared to *F. gigantica* (26.54%); certain proportion of animals (15.75%) harbored mixed infestation and others unidentified immature fluke (12.53%). In support of the present study, Gebretsadik et al. (2009) reported that 56.42% of cattle were infested with *F. hepatica* and 9.17% with *F. gigantica*. However, in another study, (Fufa et al., 2009) stated that the most common liver fluke species affecting cattle at Welaita Sodo was *F. gigantica*. The higher prevalence of *F. hepatica* might be associated with the existence of favorable ecological biotopes for the intermediate host *L. truncatula*.

The mean number of flukes found in severely, moderately, lightly affected livers was 73, 91, 23 respectively. This could be due to the fact that the severely affected liver bile duct is fibrosed and calcified which impaired the further passage of young flukes (Ramato, 1992). The finding of more than 50 flukes per liver implies very high pathogenicity of flukes according to Soulsby (1982).

The total economic loss encountered due to condemnation of infested liver from one year data recorded from abattoir in this study was 3,003,488.1408 ETB per annum. These findings were by far higher than the results reported by Adem (1994) and Daniel (1995) a total economic loss of about 154,188 and 215,000 ETB per annum in cattle due to fasciolosis at Ziway and Dire Dawa municipal abattoir respectively. This is probably due to the ecological and climatic difference between the two localities.

CONCLUSION AND RECOMMENDATIONS

The present study confirmed that fasciolosis is an important disease entity causing considerable loss of revenue due to condemnation of affected liver and carcass weight reduction. at Jimma municipality abattoir. This may be due to the fact that the area has suitable ecological condition to the existence and multiplication of the intermediate host snail (*L. truncatula*). Therefore, based on the aforementioned conclusion, the following recommendations are forwarded:

- 1) Application of good drainage and building of dams at appropriate sites in marshy and low laying areas may reduce the snail problem.
- 2) Locally available control strategies like planting of trees and shrubs that have molluscicidal activity (phytolocia dode candara with local name Endod) along streams should be given special emphasis from economic point of view.
- 3) keeping the animals off from marshy areas inhabited by interimidate host or by fencing of these dangerous zones.
- 4) The detailed epidemiological study as well as assessment of the overall economic loss due to fasciolosis is required to implement systematic disease prevention and control methods at jimma.
- 5) Finally, the farmers should be educated and informed about the importance of the disease control programs and regular deworming of animals before and just after rainy season.

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