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Prevalence and Economic Significance of Bovine Fasciolosis in Cattle Slaughtered at Aira Municipal Abattoir, West Wollega Zone, Oromia, Ethiopia

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Abstract: A cross-sectional study was conducted from September 2018 to March 2019 to estimate the prevalence of fasciolosis in cattle slaughtered at Aira municipal abattoir. A total of 384 cattle were selected with systematic random sampling and examined after slaughter for the presence and burden of liver flukes. Of 384 cattle slaughtered, 130 (33.85%) were infected with *Fasciola*. Both species of *Fasciola* were identified during the study. *Fasciola hepatica* was recovered from the livers of 98 (25.5%) cattle while *F. gigantica* was collected from the livers of 6 (1.6%) cattle. Mixed infections with both species were observed in 4 (1.04%) of them and 22 (5.7%) cattle were infected with unidentified immature liver flukes. Worms count on 130 infected livers revealed a mean fluke count of 62.2 per liver, with maximum and minimum fluke count of 796 and 4 respectively. *Fasciola* infection was highly associated (P <0.001) with body condition. Thus, based on retail value of bovine liver, direct economic loss from fasciolosis during the study time was estimated to be 2,599,680 ETB annually**.** It is concluded that fasciolosis, due to *F. hepatica* and *F. gigantica*, is prevalent in cattle slaughtered at Aira municipal abattoir and this issue needs intervention.

Key words: Abattoir · Aira · Cattle · Fasciolosis · Prevalence

INTRODUCTION

Livestock is an important component of farming system in Ethiopia and that provides a draft power, milk, meat, manure, hides, skin and other products. Livestock population of Ethiopia was estimated to be 55.4 million cattle, 26.5 million sheep and 23.78 million goats. However, the productivity of livestock in the country is low due to several constraints such as inadequate feed and its supply, poor genetic potential and diseases [1].

Among the animal diseases that hinder the animal health, parasitic infections have a great economic impact, especially in developing countries. Fasciolosis is one of the most common economically important parasitic diseases of domestic livestock, particularly in cattle and sheep.

The disease is caused by digenean trematodes of the genus *Fasciola*, commonly referred to as liver flukes. The two species most commonly implicated as the etiological agents of fasciolosis are *Fasciola hepatica* and *Fasciola gigantica. F. hepatica* has a worldwide distribution but predominates in temperate zones while *F. gigantica* is found on most continents, primarily in tropical regions [2, 3].

Several abattoir surveys conducted in various parts of the country have demonstrated the presence of fasciolosis, due to *F. hepatica* and *F. gigantica*, in ruminants. Some studies tried to demonstrate the economic losses associated with liver condemnation. Because epidemiology of fasciolosis is dynamic and may change with years [2], it is important to monitor its development to determine trends in prevalence.

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So far, in Ethiopia, most studies on parasites have been concerned and yet there is lack of information for bovine fasciolosis and estimated loss of economy due to liver condemned in abattoirs. Therefore, the objectives of this study were to determine the prevalence of fasciolosis in bovine slaughtered at Aira municipal abattoir and to estimate financial loss due to liver condemnation.

MATERIALS AND METHODS

Study Area: The study was conducted from September 2018 to March 2019 in Aira district of West Wollega zone. This district is one of 20 districts of West Wollega zone, in Oromia region, Ethiopia, which is located 504 KM away from Addis Ababa to West direction and it has a latitude and longitude of 80°12' N and 10°03' N and 34°08' E and 36°10' E respectively with an elevation of 1800-2000 meters above sea level. The minimum and maximum annual rain fall and daily temperature ranges are between 1450 to 2150 mm and 15 to 27°C respectively. The area is characterized by crop-livestock mixed farming system. Teff, wheat, barley, maize, sorghum, millet, beans, peas, coffee and nug seed are annual crops grown in the area and also cattle, sheep, goats, horse, mules, donkey, honey bee and poultry are the main livestock species raised in the study area.

Study Animals: The study animals were cattle slaughtered at Aira municipal abattoir. A total of 384 cattle were inspected during ante mortem and post mortem inspections with their identification numbers and recorded accordingly on the format prepared for this purpose from September 2018 to March 2019 at Aira municipal abattoir. The cattle slaughtered in the abattoir were being presented from different parts of the district which are characterized by similar climate ecological conditions mainly due to its altitude similarity. It is often difficult to trace the origin of the animals as they usually pass chains of markets. Some animals come directly to the abattoir from different parts of district while others pass through feedlots where they are routinely de-wormed and fed straw/hay based concentrate. All cattle included in this study were male and local indigenous.

Sample Size and Sampling Method: The sample size was determined by simple random sampling method using 95% confidence interval and calculated by using the formula given by Thrusfield [4], with 5% absolute precision and at 50% expected prevalence.

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

where:
Pexp = Expected prevalence
D = Absolute precision (5%)
N = Sample size.

Study Design and Sampling Procedure: The study was cross-sectional whereby the cattle were selected from the slaughter line using systematic random sampling in such a way that 8 animals were being examined per day from a group of varying numbers of cattle slaughtered in one day. List of the animals to be slaughtered, from which study animals were selected, was prepared while the animals were kept in lairage. Information regarding sex, age, breed and body condition of the study animals were always being recorded during ante-mortem examination.

Liver Examination: The liver of each study animals was carefully examined for the presence of lesions suggestive of fasciola infection externally and sliced for confirmation. Liver flukes were recovered for differential count by cutting the infected liver into fine, approximately about 1cm, slices with a sharp knife according to survey reported in ILRI [1]. Each mature fluke was identified to species level according to its shape and size. All intact immature and mature flukes and only fluke heads, when a portion of fluke was found were and realized in reports of Ogunrinade and Adegoke [5].

Financial Loss Assessments: Generally, all livers infected by fasciolosis were considered to be unfit for human consumption and total condemnation of livers was considered. Economic losses were calculated based on condemned livers due to fasciolosis. In the study abattoir, the average annual cattle slaughtered were estimated to be 768, while mean retail price of bovine liver in Aira town was 100 ETB.

Data Management and Analysis: Data were stored in a Microsoft Excel spread sheet and analyzed with Stata version 9 statistical software. Prevalence was calculated as percentage value. Statistical association of fasciola prevalence with body condition of the animals was analyzed using logistic regression analysis.

Breed, sex and age were not included in the analysis because all animals included in this study were local indigenous cattle, male and adults.

Table 1: Prevalence of fasciola species in cattle slaughtered at Aira municipal abattoir (n=384)

Fasciola species	Infected liver	Prevalence (%)
F. hepatica	98	25.5
F. gigantica	6	1.6
Mixed infection	4	1.04
Immature flukes	22	5.7
Total	130	33.85

Table 2: Mean liver fluke count per affected liver in cattle by fasciola species (n=130)

Fasciola species	Mean count
F. hepatica	34.29
F. gigantica	4.3
Mixed infection	16.25
Immature flukes	7.36
Total	62.2

RESULTS

Prevalence: A total of 384 indigenous cattle breeds that were slaughtered at Aira municipal abattoir were examined for the presence of fasciolosis. Among the examined animals, 130 (33.85%) were positive for fasciolosis. *Fasciola hepatica* was the highest with 25.5% (98/384) prevalence, while *F. gigantica* was with 1.6% (6/384) prevalence. Mixed infestation with the two species was recorded to be 1.04% (4/384) and the remaining 22 livers (5.7%) harbored immature flukes which were not identified to species level (Table 1).

Fluke Count: Fluke count ranged between 796 and 4 with a mean fluke burden of 62.2 per infected liver. Mean count was highest in animals with *Fasciola hepatica* infection followed by those infected with mixed infection (Table 2).

Financial Loss Assessments: The prevalence of bovine fasciolosis in Aira municipal abattoir was estimated to be 33.85%. The estimated annual loss from the condemnation was calculated according to mathematical computation using the formula set by Ogunrinade and Adegoke [5]:

$$ALC = CSR \times LC \times P$$

where,

ALC = Annual loss from liver condemnation
CSR = Mean annual cattle slaughtered at Aira municipal abattoir
LC = Mean cost of one liver in Aira town
P = Prevalence of bovine fasciolosis at Aira municipal abattoir

Accordingly, the result from this calculation is:

$$ALC = CSR \times LC \times P$$
$$= \mathbf{768*100*33.85}$$
$$= \mathbf{2,599,680}$$

DISCUSSION

The overall prevalence of bovine fasciolosis observed in this study (33.85%) is in close agreement with the results of studies conducted by Pfukenyi and Mukaratirwa [6] from Zimbabwe who reported bovine fasciolosis of 31.7% prevalence. However, it is much lower than that of many other reports of similar studies from different abattoirs in the country and elsewhere in Africa. Yilma and Mesfin [7] reported a 90.7% prevalence of fasciolosis in cattle slaughtered at Gondar abattoir, Gemechu *et al*. [3] reported a 45.45% prevalence of bovine fasciolosis in cattle slaughtered at Haramaya slaughter house, Tolosa and Tigre [8] recorded a prevalence of 46.2% at Jimma abattoir and Phiri *et al*. [9] from Zambia reported 53.9%.

On the other hand, a lower prevalence of fasciolosis with 5.13% prevalence had been realized by Damwesh and Ardo [10]. Another lower prevalence of fasciolosis was recorded in cattle slaughtered at Yola Modern Abattoir, Adamawa State, Nigeria and 14% was recorded in cattle slaughtered at Wolaita Soddo abattoir [11].

Difference in prevalence among geographical locations is attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature. Prevalence of fasciolosis had been reported to vary over the years mainly due to variation in amount and pattern of rainfall was manifested by Grabber and Dayens [12].

The findings of the present study is consistent with the results of bovine fasciolosis of several abattoir studies in different parts of Ethiopia, with the predominance of *F. hepatica* to *F. gigantica* as reported by Tolosa and Tigre [8], Ibrahim and Tolosa [13] and Berhe and Tadesse [14]. However, higher prevalence of *F. gigantica* than *F. hepatica* in cattle slaughtered at Wolaita Soddo abattoir in southern Ethiopia was recorded. The findings of mixed infection with the two species of *fasciola* indicate that there are places in the country where the climate-ecological conditions favor the existence of the intermediate snail hosts for both species.

Difference among the relative prevalence of the two species of fasciola in cattle slaughtered in abattoirs located in different regions of the country may be

explained by the variation in the climatic and ecological conditions of the areas feeding the abattoirs. Several studies in other Africa countries, however, showed that *F. gigantica* is the predominant if not the only prevalent species [15].

The current study documented a mean fluke count of 62.2 per infected liver. A previous abattoir survey in Addis Ababa abattoir and northern Ethiopia recorded a comparable mean burden of 73.5 flukes per infected liver as indicated in the study of Yilma and Mesfin [7]. On the other hand, a lower mean fluke burden per infected liver was documented by Gemechu *et al.* [3] in Haramaya slaughter house of Haramaya University College of Veterinary Medicine. The more mean flukes an animal has, the more blood it losses and hence the more anemic it becomes is explained by Cawdery *et al*. [16].

There was a statistically significant association (P <0.001) between fasciola prevalence and body condition of the animals. In a similar study, Bekele *et al.* [17] reported high prevalence of fasciolosis in cattle with poor body condition compared to cattle in medium and good body conditions. Chronic fasciolosis characterized by progressive loss of condition is indicated by Damwesh and Ardo [10]. However, it must be born in mind that cattle coming from feedlots, which are expected to be in good body conditions, are most likely to be de-wormed than cattle that come directly from free grazing areas. As cattle slaughtered at Aira municipal abattoir originate almost from the district, it could be concluded that fasciolosis is still prevalent in cattle in the district. The climate-ecological conditions favorable for survival and development of the intermediate snail hosts for the two species of fasciola are also prevalent.

The total annual economic losses encountered due to total condemnation of infected liver in Aira municipal abattoir were calculated to be 2,599,680 ETB. The present finding is by far greater than the results reported by Abdul [18] who reported total financial losses of 154,188 and 215,000 ETB annually in cattle due to fasciolosis at Ziway and Dire Dawa municipal abattoirs, respectively. This higher value in the present study might be due to the higher prevalence recorded despite the number of animals slaughtered.

CONCLUSION AND RECOMMENDATION

The present study revealed that the prevalence of bovine fasciolosis in the study area was very high and fasciolosis was a major cause of liver condemnation and consequently resulted in high financial losses. The abattoir had no proper origin recording system, so it was difficult to contribute in the control by feedback mechanism by reporting the prevalence of the disease to the area from where animals were originated because of the difficulty to trace the origin of the animals as they usually pass chains of markets. Presence of poor management system was the main factor that might have contributed to the prevalence of the disease. Finally the total annual financial loss due to bovine fasciolosis in the study area from organ condemnation (direct loss) was very high.

Based on the above conclusions, the following recommendations are forwarded:

- Awareness creation programs should be launched to farmers for appropriate live stock management.
- Treating infected and suspected animals by broad spectrum antihelmentics before and after rainy season.
- Educating farmers about the methods of controlling fasciola infestation in cattle which include using trematocidal specific antihelmintics which are effective against both mature and immature flukes such as diamphenethide, clorsulon and triclabendazole.
- Education about the effects of bovine fasciolosis and the associated financial losses should be extended to farmers as this would encourage them to deworm their animals.

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