

Prevalence Rate and Economic Importance of Bovine Fasciolosis in Bedele Municipal Abattoir, Ethiopia

¹Wakuma Mitiku, ¹Bikila Abdena and ²Garoma Desa

¹Shambu Municipal Abattoir, HorroGuduruWollega Zone Agricultural Office, Ethiopia

²National Institute for Control and Eradication of Tsetse Fly and Trypanosomosis, KalitiTsetse fly Mass Rearing and Irradiation Center, P.O. Box 19917, Addis Ababa, Ethiopia

Abstract: A cross sectional study was conducted in Bedele municipal abattoir to determine the prevalence and economic significance of bovine fasciolosis by using post- mortem examination of liver of slaughtered animals from November 2008 to June 2009 on 384 slaughter animals. From the total cattle slaughtered, 121 livers were positive for fasciolosis and the prevalence was 31.5%, this indicates that the disease was one of major problems in the study area. The two species *Fasciolahepatica* and *Fasciolagigantica* were also observed separately and in mixed form. Out of the positive results (121), 78 livers (64.5%) harboured *F. hepatica*, 30 livers (24.8%) *F.gigantica* and 13 livers (10.7%) were found to be infected with mixed species. Statistical comparison, using chi square was made to determine the presence of significant variation between sexes of the animals with prevalence of the disease. There was no significant variation between the sex of the animals ($P>0.05$). The total annual economic losses incurred due to fasciolosis at Bedele municipality abattoir was estimated on livers condemned and reduction in beef production. The mean retail price of one liver and one kilogram of meat in Bedele town was taken as 20 Birr and 40 birr respectively. The average number of cattle slaughtered at Bedele municipality abattoir was 1920 per year based on three years recorded data, thus accounted a total loss of 316,915 ETB. Examination of the liver of animals during post-mortem examination is the most reliable method to detect fluke infection. Strategic anthelmintic treatment with appropriate flukicidal drugs twice a year is one of the best methods of controlling the disease.

Key words: Fasciolosis • Prevalence • Bovine • Post-Mortem • Economic Importance • Bedele

INTRODUCTION

Bovine fasciolosis is an economically important parasitic disease of cattle caused by Fasciolidaetrematodes of genus *Fascioca*. The two important species of this genus, *Fasciola hepatica* and *Fasciolagigantica*, are commonly known as liver flukes. Generally, the distribution of fasciolosis is worldwide; however, the distribution of *F. hepatica* is limited to temperate areas and high lands of tropical and sub-tropical regions [1]. The definitive hosts for *F. hepatica* are most mammals among which sheep and cattle the most important one. The geographic distribution of trematode species is dependent on the distribution of suitable species of snail. The genus *Lymnaea* in general

and *L.trancatula* in particular is the most common intermediate hosts for *F. hepatica*. This species of snail was reported to have a worldwide distribution [2].

The presence of Fasciolosis due to *F. hepatica* and *F. gigantica* in Ethiopia has long been known and its prevalence and economic significance has been reported by several workers; different works so far conducted in Ethiopia reported variable prevalence rates of bovine fasciolosis in different localities of the country [3-11].

In Ethiopia, the prevalence of bovine fasciolosis has shown to range from 11.5% to 87% [12]. The study conducted at Dire Dawa revealed that out of 2224 cattle slaughtered in the abattoir, the prevalence of fasciolosis has been found to be 14.4% in which *F. hepatica* was observed to be the most commonly recovered fluke

species [13]. *F. hepatica* was shown to be the most important fluke species in Ethiopian livestock with distribution over three quarter of the nation except in the arid north-east and east of the country. The distribution of *F. gigantica* was mainly localized in the western humid zone of the country that encompasses approximately one fourth of the nation [12].

Moreover, the studies also showed that fasciolosis has higher economic significance on animal production and productivity. The economic losses due to fasciolosis throughout the world are enormous and these losses are associated with mortality, morbidity, reduced growth rate, condemnation of fluky liver, increased susceptibility to secondary infectious and expense due to control measures [12]. According to the study conducted by Daniel [13] and Abdul [14] a total economic loss about 154,188 and 215,00 ETB per annual in cattle were reported due to fasciolosis at Zeway and Dire Dawa municipal slaughtered house respectively.

Diagnosis is based primarily on clinical sign, seasonal occurrence and previous history of fasciolosis on the farm or the identification of snail habitats, PME and examination of faeces for fluke eggs. Even though, it is impossible to detect fasciola in live animals, liver examination at slaughter or necropsy was found to be the most direct, reliable and cost effective technique for the diagnosis of fasciolosis [2].

MATERIALS AND METHODS

Description of Study Area: Bedele is located in the western part of Oromia at latitude of 8° 26'N and longitude of 36°26'E, at an altitude of 1300-2000m above sea level. Topographically, mountains, plateaus, rivers and hills mark Bedele. The mean annual rainfall is 1950mm and the mean annual temperature is 17°C. According to the statistical data obtained from Bedele Agricultural Bureau (2009), the woreda have 41 kebeles, of which, 81%, 14% and 15% accounts Woinadega, kola and Dega respectively. The Woreda have 114,057 hectares of land, of which 8.8% grazing land, 42.8% is farmland, 7.2% is forest, 0.9% is swampy area and 40% is maintain. The human population of the woreda is estimated to be 119,180 in rural area and 29,358 in urban area. The livestock population of the woreda is 52,197 cattle, 15,230 sheep, 11,090 goat and equine species and the production of the animal in the woreda is under extensive management system. The main purpose of the abattoir is processing of fresh meat for human consumption. Cattle slaughtered in the abattoir were mostly adult male indigenous zebu (>4 years) and only

very few were females. Most of the slaughtered cattle at the abattoir originate mainly from different markets in their vicinity.

Study Population: The study population includes local breeds of cattle and 384 animals were randomly selected to determine the infection prevalence and economic significance of bovine fasciolosis. All these animals were privately owned by small holder farmers. Study animals were managed under traditional extensive system and depend mostly on grazing with a minimum or no supplementary feed and health care.

Study Design: The study design was cross sectional study with simple random sampling which was conducted for slaughtering from November 2008 to February 2009 at Bedele Municipal abattoir.

Study Methodology

Post Mortem Examination: A cross sectional study was conducted to determine the prevalence and economic significance of bovine fasciolosis by using post mortem examination of liver of slaughtered animal during the study period by visualization and population of the entire organ that was followed by transverse incision of the organ across the thin left lobe [1, 2]. Species identification of the recovered *fasciola* was also performed based on the morphological features of the agents and classified in to *F. hepatica*, *F. gigantica* and mixed forms of liver fluke [1, 2].

Economic Loss Analysis Due to Fasciolosis: The total annual economic losses incurred due to fasciolosis at Bedele Municipality abattoir was estimated on livers condemned and reduction in beef production. The mean retain price of one liver and one kilogram of meat in Bedele town was taken as 20 Birr and 40 birr respectively. The average number of cattle slaughtered at Bedele municipality abattoir was 1920 per year based on three years recorded data. A 10% estimated carcass weight loss mentioned by German workers and Hawkins and Morris [16] due to fasciolosis was the parameter used for calculating carcass weight loss.

Statistical Analysis: Statistical comparison, using chi square was made to determine the presence of significant variation between sexes of the animals with prevalence of the disease. Prevalence of fasciolosis was calculated as the number of the cattle found to be infected with fasciola, expressed as the percentage of the total number of cattle slaughtered [17]. The economic significance of the

problem was analyzed based on the information obtained during interview and calculating the annual economic loss using the formula set by Demssie *et al.* [18].

Sampling Method and Sample Size: The simple random sampling technique was used to select the animals to determine the prevalence and economic significance of bovine fasciolosis in the study area. A sample size can be determined based on the study type and sampling method for the investigation. Let the expected prevalence of bovine fasciolosis in the area is 50% and the precision is 5%, the sample size was calculated by the formula [17].

$$n = \frac{1.962 \cdot p \cdot ex(1 - p \cdot ex)}{d^2}$$

where:

n = The sample size

d = The desired absolute precision = 5%

p = The expected prevalence = 50%

Accordingly, 384 cattle randomly sampled from the animal brought to the abattoir for slaughter.

RESULTS

Over All Prevalence: A four months (November 2008 to February 2009) Post-mortem examination was carried out on 384 adult indigenous cattle (367) males and 17 females) for fasciolosis. Out of the 384 cattle slaughtered at Bedeleminiciapal abattoir, 121 cattle (114 males and and 7 females) were positive for fasciolosis giving a mean prevalence rate of 31.5% (Table 4). The highest prevalence rate was observed during November (43.4%) and the lowest in February (20.3%).

Fasciola Species Identification: Identification of liver fluke species was conducted and the result obtained revealed the presence of both species of *Fasciola*. From 121 livers found positive for fluke infection during post-mortem inspection of slaughtered animal, 78 livers (64.5%) harbored *F. hepatica*, 30 livers (24.8%) *F. gigantica* and 13 livers (10.7%) were infected with mixed species.

The chi square and p value were calculated and there was no significant variation between the sex of the animals (P>0.05).

Economical Loss Analysis: The total annual economic loss due to fasciolosis was calculated using the following formula:

Table 4: Monthly prevalence of fasciolosis at Bedele Municipal abattoir from November 2008 to February 2009

Month	Number of		Prevalence (%)
	cattle examined	Positive animals	
November	120	52	43.4
December	108	28	25.9
January	102	30	29.4
February	54	11	20.3
Total	384	121	31.5

Table 5: Species of *Fasciola* encountered in affected livers during post mortem examination

Species of fasciola	Number of condemned liver	Percentage (%)
<i>F. hepatica</i>	78	64.5
<i>F. gigantica</i>	30	24.8
Mixed	13	10.7
Total	121	100

Table 6: Prevalence of bovine fasciolosis on sex basis

Sex	No of samples	No of affected	Prevalence (%)
Male	367	114	31.1
Female	17	7	41.2
Total	384	121	31.5

$\chi^2 = 0.77$

P = 0.38

- Annual cost of condemned liver = NALX CL X %con
Where NAL = Average number of cattle slaughtered at Bedele municipality abattoir per year.

CL = Mean cost of one liver in Bedele town

%con = percentage of livers condemned due to

Fasciolosis

$$= 1920 \times 20 \times 31.5\%$$

$$= 12,096.00$$

- Indirect annual loss due to reduction of meat = NAL X CI X PA X prev.

Where NAL = Average no of animals slaughtered at Bedele municipality town

CI = carcass weight loss in individual animals

PA = Average market price of one kilogram of beef in Bedele town

Prev. = Prevalence rate of fasciolosis in Bedele municipality Abattoir

$$1920 \times (126 \times 10\%) \times 40 \times 31.5\% = 304,819$$

The total annual economic loss due to fasciolosis at Bedele municipality abattoir was therefore 1+ 2 = 316,915.00.

DISCUSSION

Fasciolosis is wide spread ruminant health problem and caused significant economic losses to livestock

industry. Its prevalence and economic impacts has been reported by different researchers found in different parts of the world. In Africa for instance, Hunter [19] recorded prevalence of 33% in Kenya, 37% in Sudan, 45% in Cameroon, 50% in Rwanda, 61% in Uganda and 62% in central Africa Republic.

Different studies carried out on the importance of fasciolosis in different parts of Ethiopia showed enormous economic impact of the disease mainly due to affected liver condemnation at the abattoirs and loss of livestock production, Graber [20]. Baheru and Ephraim [21] Indicated the existence of fasciolosis in almost all regions of Ethiopia.

One of the most important factors that influence the occurrence of fasciolosis in an area is availability of suitable snail habitat [2]. In addition, optimal base temperature to levels of 10°C and 16°C are necessary for snail vectors of *F. hepatica* and *F. gigantica* respectively. These thermal requirements are also needed for the development of *Fasciola* within snails. The ideal moisture conditions for snail breeding and development of larval stages with the snails are provided when rainfall exceeds transpiration and filled saturation is attained. Such conditions are also essential for the development of fluke eggs, miracidia searching for snails and dispersal of cercariae [2].

Yilma and Malone [10] Reported that; in Ethiopia *F. hepatica* and *F. gigantica* infections occur in areas above 1800m m.a.s.l. and below 1200 m.a.s.l. respectively. The high prevalence rate of *F. hepatica* may be associated with the existence of favorable ecological biotopes for *L. truncatula*. Relatively small proportion of cattle were found infected with *F. gigantica* alone or mixed infection with both species. This may be explained by cattle coming for slaughter from high land and middle altitude zone flood prone areas, drainage ditches are favorable habitat to natalensis [2].

In this study, higher prevalence of bovine fasciolosis (31.5%) was obtained when compared with the prevalence reported by Daniel [13] (14.4%) at Diredawa Municipality abattoir. This is probably due to the ecological and climatic difference between the two localities. Moreover, the management system in practice could also be the probable reason for the variation.

The 31.5% prevalence of bovine fasciolosis found in this study is similar with the 30.43 and 33.4% prevalence of bovine fasciolosis reported at Awassa and Gondar by Hailu [22] and Fekadu [23], respectively.

Of the total livers, 64.5% of them were found to be positive for bovine fasciolosis infected by *F. hepatica*, whereas, *F. gigantica* and mixed forms of *Fasciola*

species were recovered in 24.8% and 10.7% of the cases. Similar study conducted at Zeway abattoir reported 60.3% of the liver harbored *F. hepatica*, 10.2% *F. gigantica* and 29.5% infested by both species [9]. Zewdu [24] Reported that the dominant *Fasciola* was *F. gigantica* at Jimma municipal abattoir.

The highest prevalence rate was analyzed during October, when the wet-ecological conditions still prevailed. It has been described that the bionomic intramoluscan stages of the flukes often reach the threshold during the wet months of the year. During the dry periods, breeding of the snails and development of the larval flukes slow down or stops completed and snail undergo a state of aestivation [10].

There was no statistically significant difference ($p>0.05$) in prevalence between females (41.2%) and males (31%). This shows that sex seems have no effect on the prevalence and both sexes are equally susceptible and exposed to the disease and this might be due to grazing of both sex groups in similar fasciola contaminated pasture land. Moreover, it might also be that fasciolosis is not a disease directly related to animal reproductive system. Similar results have been reported by Dinka [25] and Getachew *et al.* [26].

Economic importance of bovine fasciolosis has been the main concern of several workers in Ethiopia. Baheru and Ephraim [21] reported an annual loss 360 million Ethiopia Birr per annum on the national basis. In the present study area, the total economic loss due to fasciolosis per year was estimated to be 316,915.00 ETB. Economic analysis reported from other parts of the country include, Yilma and Mesfin [27] in Debre Zeit (560,679.58 ETB), Mulugeta [6] in Kombolcha (287,911.32 ETB), Wondwosen [5], Hagos [28] in Mekele (266,741.37 ETB) and Tolossa and Tigre [29] in Jimma (55,080.00 ETB). These results indicate that fasciolosis cause significant losses in different parts of Ethiopia at large.

CONCLUSION

In this study, medium prevalence (31.5%) of bovine fasciolosis was obtained. The dominant species *Fasciola* revealed was *F. hepatica*. Bedele municipality abattoir losses sum of money that equals 316,915.00 Birr annually due to liver condemnation and carcass weight loss caused by fasciolosis.

In general, fasciolosis is one of the major obstacle for livestock development in Ethiopia by inflicting remarkable direct and indirect losses at different parts of the country where its occurrence is closely linked to the presence of biotypes suitable for the development of snail

intermediate host. From the above conclusion, the following recommendations are forwarded:

- Strategic antihelmintic treatment with appropriate flukicidal drugs should be practiced twice a year, i.e. before and after rainy seasons to eliminate the fluke burden of the host of the animal and minimize the pasture contamination by fecal egg shedding, thus interrupting the life cycle.
- Control of the snail, which has been the major facet of fluke control for many years, need careful ecological studies, but the tremendous reproductive potential of the snails and the high cost needed for their control makes the snail control program often unsuccessful. A combination of control measures including drainage; fencing and molluscicides have to be used to ensure a satisfactory degree of control in long run.
- Further study on the epidemiology of the disease, the biology and ecology of the snail intermediation host are useful in planning and programming control strategies.
- Finally, the farmers should be well educated and informed about importance of the disease control programs and good management systems.

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