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Prevalence of Fasciolosis and its Direct Economic Loss Due to Liver Condemnation on Humbo Abattoir, Woliata Zone, Ethiopia

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Abstract: A cross sectional study was conducted to determine the prevalence of fasciolosis and the associated risk factors, identify the dominant species of liver flukes in the study area and its direct economic loss due to liver condemnation from 384 cattle slaughtered at Woliata zone, Humbo districts (Tebela) municipal abattoirs from December to June 2016/17 using ante mortem & post mortem examination of randomly selected animals; gross examination of the identified liver fluke and calculation of the cost of liver condemned due to the liver fluke. In the current study, the overall prevalence of fasciolosis was 30.74%. The prevalence of *bovine* fasciolosis in the study area was significantly affected by age and body conditions. However, the prevalence were not significantly ($p>0.05$) associated by sex of the slaughtered animals. Examination of the liver and the bile-duct of slaughtered animals during postmortem inspection were the most reliable methods to discover liver fluke infection. *Fasciola hepatica* was found to be the predominant (25%) species followed by *Fasciola gigantica* (4.7%) and mixed infection (1.4%) in the study area. There was higher prevalence of the disease on adult than young. The total annual direct economic loss from liver condemnation due to fasciolosis was estimated to be 12, 984, 576 ETB. Therefore, it can be concluded that fasciolosis is highly prevalent and Losses due to liver condemnation should not be over looked since fasciolosis constitute a major liver condemnation in the study area. Implementation of control and prevention strategy is mandatory.

Key words: Abattoir · Cattle · Economic Loss · Fasciolosis · Humbo · Prevalence

INTRODUCTION

Ethiopia owns huge number of livestock having high contribution for meat consumption and generates cash income from export of live animals, meat edible organs and skin. In spite of the prices of huge ruminant population, Ethiopia fails to optimally exploit these resources due to a number of factors such as recurrent drought, poor nutrition, poor husbandry practice, infrastructures problem, rampant animal disease and shortage of trained man power and lack of Government policies for disease control and prevention [1].

Fasciolosis is one of most common economically important parasitic disease of domestic livestock in tropical and sub tropical countries which hinder the animal health, great economical impact and limit productivity of ruminant particularly in cattle. The diseases is caused by digenean trematods of the genus Fasciola, commonly referred to as liver flukes and the two species most commonly implicated as the etiological agent of fasciolosis are *Fasciola hepatica* and *Fasciola gigantica* are causes fasciolosis in ruminants [2].

The annual loss due to parasites in Ethiopia is estimated as 700 million Ethiopian birr [3]. The economic losses due to fasciolosis are characterized by weight loss, anemia, reduced growth rate, hypoproteinemia, mortality and morbidity, Condemnation of liver, increase susceptibility to secondary infection and expense of control measures [4]. According to [5] and [3], Fasciolosis is causing an average loss of 6300 USD and 4000 USD per annum at Jimma, Sodo municipal abattoir respectively. In Kenya, 0.26 Million USD annual loss attributable to fasciolosis associated liver condemnation in cattle slaughtered. It's regarded as one of the major setbacks to live stock productivity, incurring huge direct and indirect losses in the country.

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Humbo is one of the districts of woliata zone where the environmental conditions and altitude conductive for the occurrences of fasciolosis, causing to huge economic loss. However, there is little published information about the disease in the study area.

Therefore; the present study was conducted with the objectives: to determine the prevalence of bovine fasciolosis & the associated risk factors; to assess the direct economic loss due to liver condemnations and to identify the predominant species of fasciola in the study area.

MATERIALS AND METHODS

Study Area: The study was conducted in woliata zone Humbo district municipal abattoir from December 2016 to June 2017 which is located at 400 km from capital city of Ethiopia (Addis Ababa), 148 km from regional state which is Hawassa and 15 km from zonal town of Sodo. The mean annual rainfall is 1950mm. The mean annual temperature of the woreda is about 14°c varying between the maximum February 25.2% and minimum in August 14°C. The total live stock population in Humbo woreda is 152044 cattle, 21825 sheep, 47689 goats, 12502 equines and 734924 poultry (HDADO, 2014).

Study Population: The study population was 384 randomly selected cattle slaughtered at Humbo municipal abattoir using routine meat inspection. The cattle were indigenous Zebu cattle brought for slaughter from different localities and livestock markets in the vicinity.

Study Design: A cross sectional study design was carried out to determine the prevalence and the direct economic lose from liver condemnation due to fasciolosis among cattle using routine meat inspection and postmortem examination of liver.

Sampling Method and Sample Size Determination: Simple random sampling was used to determine the prevalence of fasciolosis and direct economic loss from liver condemnation due to fasciolosis. Sample size was determined based on confidence interval (CI) 95%, 5% desired absolute precision and with assumption of 50% expected prevalence of fasciolosis. Accordingly, the total number of sample size for study was 384 cattle by using the formula given by [6].

$$N = \frac{(1.96)^2 \times P_{exp}\ (1- P_{exp})}{D^2}$$

where;
N: sample size
P_{exp}: expected prevalence
D: desire absolute precision

Study Methodology

Anti Mortem Examination: Complete ante-mortem examination of the animals was carried out shortly prior to slaughter. Inspection of the animals was made while at rest and/or in the motion for any obvious sign of disease. Anti-mortem examination with detail record about the species, sex, origin, body condition and age of the animal were taken [7]. Body condition of each cattle was estimated based on [8] ranging from emaciated to obese and also breeds, sex, age and origin of body condition of animal was examined as described by [9].

Post Mortem Examination: Previously identified animals and their livers were carefully supervised and were examined and passed to Post mortem examination of liver and associated bile duct was carefully performed through by visualization, palpation and internal organs are followed by transverse incision of the organ across thin left lobe in order to confirm the case [10].

Adult Fasciola parasites from infected liver were taken to the laboratory for species identification. This was conducted based on morphological features of the agent and classified in to *F. hepatica* and *F. gigantica* by [11]. Liver having Fasciola species condemned were register and flukes were conducted for species identification [12].

Species Identification: After making systemic incision on liver parenchyma and bile ducts, flukes were collected in the universal bottle containing 10% formalin preservative and examined to identify the involved species. *F. hepatica* and *F. gigantica* are very similar to each other and the variation by their length and width. *Fasciola hepatica* measures 25-30mm of length and 8-15mm of width [12] and are morphologically Fasciola are leaf shaped, dorso ventrally flattened [13].

Fig. 1: Adult stage of *Fasciola hepatica* (left) and *Fasciola gigantica* (right)
Source: [12]

Fasciola gigantica has similar appearance, but it is typically longer approximately 28-52mm of length and 15mm of width and has narrower body and more leaf like in shape [14].

Direct Economic Loss Due to Liver Condemnation: Direct economic loss was calculated from liver condemnation as the result of fasciolosis. Generally all infected livers with fasciolosis were unfit for human consumption. Through interview made with local butcher men in Tebela town, the average weight of *bovine* liver and price of one liver was calculated to be 3kg and 300 Ethiopian Birr, respectively. The average number of cattle slaughtered in this municipal abattoir was 1408 per year based on 3 year record data and thus loss due to fasciolosis was calculated by using the following formula [15].

DALC: $ANLxP_1xALP$

where;
DALC: Direct annual liver condemnation
ANL: Average number of cattle slaughtered annually
P_1: Prevalence rate of fasciolosis at the abattoir
ALP: Average liver price of at the town

Data Management and Analysis: The collected data were recorded and entered in Microsoft - excel. The prevalence of cattle found to be infected with Fasciola were calculated by using SPSS software version 20.0. Pearson's chi-square (χ^2) was used to evaluate the association between the prevalence of fasciolosis and different risk factors. P- Value less than (5%) level of significance were considered as significant in all analysis.

RESULT

In the present study, a total of 384 cattle were sampled for determination of fasciolosis from Humbo municipal abattoir. The variation in age, sex, body condition were used as risk factors for assessing the prevalence of fasciolosis and cost of liver taken as 300ETB, the annual slaughter rate in the study area estimated as 1408 for assessment of direct economic loss due to liver condemnation.

Prevalence of Bovine Fasciolosis: The overall prevalence of bovine fasciolosis in the study area was 30.74% from which 98 (25.5%) were male, 79 (20.5%) were adult and 97(25.26%) were at medium body condition score (Table 1).

Table 1: Prevalence of bovine fasciolosis related to age, sex and body condition

	No. of cattle examined	No. of cattle affect	(%) of total sample	χ^2	P- Value
Sex					
Male	301	98	25.5	1.485	0.476
Female	83	20	5.2		
Age					
<5rs	72	39	10.2	37.615	.0.000
>5rs	312	79	20.5		
BC					
Good	123	21	5.5	16.192	0.000
Medium	261	97	25.2		

Table 2: Prevalence of bovine fasciolosis related to risk factor of species

Cattle examined	Total No of (positive)	*F. Hepatica*	*F. Gigantica*	Mixed
384	118 (30.74%)	96(25%)	18(4.7%)	4(1.04%)

Table 3: The association of species of fasciola with different risk factors

		Species of the parasites			
Risk factors	Category	Fasciola Hepatica	Fasciola Gigantica	χ^2	p- value
Sex	Male	268	38	0.045	0.832
	Female	69	9		
Aage	>5yrs	288	35	3.730	0.053
	<5yrs	49	12		
Body condition	Medium	233	31	0.194	0.659
	Good	104	16		

Out of 384 slaughtered animals during the study period 118 (30.74%) were found to be positive. 96(25%) liver were identified as *F- hepatica*, 18(4.7%) liver were *F-gigantica*, 4(1.04%) liver were affected by mixed infection (Table 2).

Association of Prevalence of Fasciolosis with Different Risk Factors: Analyses made to look the association of prevalence of fasciolosis with different risk factors are presented as follows:

Sex: There were no significant association between the prevalence of fasciolosis and sex of the slaughtered animals ($p>0.05$). However, it is higher in male (Table 1).

Age: The prevalence of fasciolosis had significant variation within the age of the slaughtered cattle it was higher in adults (Table 1).

Body Condition: Out of 384 slaughtered animals, 97(25.2%) fasciolosis positive cattle were at good body condition scoring. There was also significant difference between prevalence of fasciolosis and body condition scoring of the cattle. (P- 0.000, which is less than 0.05) (Table 1).

Association of Species of Fasciolosis with Different Risk Factors: There was no significant association between the risk factors and species of the parasite (Table 3).

Direct Economic Loss Due to Liver Condemnation: The 118 infected livers of cattle were condemned. In the study abattoir the average annual cattle slaughtered rate was estimated to be 1408 while mean retail price of bovine liver in Humbo (tebella) town was 300 ETB. A total of 12, 984, 576 ETB annual losses were calculated from organ condemnation using the current abattoir prevalence (30.74%).

DISCUSSION

Fasciolosis is important on the epidemiology of disease that affecting productivity of livestock and estimate the financial losses incurred through condemnation of affected organs/liver/ [16]. In Ethiopia bovine fasciolosis is prevalent in almost all regions in livestock industry; however, the prevalence rate, epidemiology and distribution of Fasciola species vary significantly with locality. This is attributed mainly to the variation in the ecological, climatic conditions and livestock management [17] and [18].

In the current study, prevalence of bovine fasciolosis is 118 (30.74%). It is higher prevalence when compared with the results reported by [13] (14.4%) in Dire Dawa Municipal abattoir and [19] (22.69%) in the Mizan Tapi municipal abattoir and lower when compared with [20] (46.58%) in Jima municipal abattoir. The current prevalence is 118 (30.74%) approximately of similar with the result of [21] (30.48%) and [14] (31.5 %). The difference may be due to difference in the geographical location.

Both species of fasciolosis were identified during the study period, however, *F. hepatica* 96(25%) was most prevalent compared to *F. gigantica* 18(4.7%) and mixed 4(1.04%). The highest prevalence of *F. hepatica* indicates there is favorable ecological condition for laymen trancatula that is an intermediate host of *F. hepatica* in the study area because there is marshy area around Humbo River. The lower prevalence of *F. gigantica* was may be due to the unfavorable condition to existence and multiplication of snail lymeanatalensis in the study area. The present study reveals sex had no significant association to the prevalence of bovine fasciolosis. The finding was in line with in Debre - Birhan [16] who showed that sex had no impact on the infection rate and hence both male and female were equally susceptible to the disease.

The direct economic lose encountered due to condemnation of infected liver was higher than the findings in Assela 698, 700.6 Ethiopian Birr [15]. The difference in the estimated economic losses could be attributed to the increase in the price of liver and meat in the global market in general and in Ethiopia in particular.

CONCLUSION

Moderate prevalence of bovine fasciolosis was obtained when compared with prevalence reported by different researchers at different area. The dominant fasciola was *Fasciola hepatica* at Humbo abattoir that induces economic losses in 12, 984, 576 ETB due to liver condemnation. Fasciolosis is one of the major diseases that tackle for the development of livestock industry in Ethiopia. The parasite specifically in the current study *F. hepatica* is the most prevalent; this is due to suitability of intermediate host, Lamina trancatula.

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

- Awareness to farmers about the disease should be created to enable them actively participate in the control programs,

- Regular use of anti helementhics should be performed to mitigate the prevalence of the disease
- Snail control should be implemented to reduce the magnitude of the problem.

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