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Abstract- A cross-sectional study was conducted to determine the abattoir prevalence of bovine fasciolosis and its economic importance in Robe Municipal Abattoir. A total of 502 cattle were randomly sampled and examined after slaughter. Out of 502 cattle examined at post mortem, 68.72% (345) were positive for fasciolosis. The prevalence of bovine fasciolosis was found to be significantly affected ($P < 0.05$) by the age of animal, in which young animals were affected than adult animals. The prevalence of bovine fasciolosis was also higher ($P < 0.05$) in poor body conditioned animals than good body conditioned animals. Sex of the animal was not found as a significant factor ($p > 0.05$) affecting the prevalence of disease. The prevalence of *Fasciola hepatica* was 238(68.98%) which was predominant among *Fasciola* species, causing bovine fasciolosis in the study areas. Whereas, the prevalence of *Fasciola gigantica* was 107 (31.02%). The economic significance of bovine fasciolosis was also assessed based on condemned livers. Thus, based on retail value of bovine liver, the direct economic loss from fasciolosis during the study time was estimated to be 164,880 ETBannually.

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I. Introduction

Fasciolosis is a liver parasitic infection affecting mainly both domestic and wild ruminants, but monogastrics and even humans can be infected (Knubben-Schweizer 2010; Mas-Coma *et al.* 1999; Qureshi *et al.* 2005). The two most important species that cause fasciolosis are *Fasciola hepatica* and *Fasciola gigantic* (Mungube *et al.* 2006; Rapsch *et al.* 2006; Terefe *et al*. 2012; Tolosa and Tigre 2007). These species are the causative agents of fasciolosis of animals and human, are reported from different regions in Iran (Ashrafi *et al.* 2006; Moghaddam et al. 2004; Rokni *et al.* 2002). It is a serious disease of herbivorous animals (Torgerson and Claxton, 1999), leading to huge economic losses in livestock production, while human infection has long been seemed to be accidentally (Mas-Coma *et al.,* 2005). The distribution of *Fasciola hepatica* is limited to temperate areas and high land of tropical and sub-tropical regions while *Fasciola gigantica* is wide spread in most parts of tropical Africa. Thus, the distribution of two *Fasciola* species overlap in many African and Asian countries and sometimes in the same country, although in such cases the ecological requirements of the flukes and their snail intermediate host is distinct (Mas-Coma *et al*., 2005; Walker *et al.,* 2008). The geographic distribution of *Fasciola* species is dependent on the distribution of suitable species of snails such as *Lymnae natalensis* and *Lymnae truncatula,* the most common intermediate hosts and usually associated with herds and flocks grazing wet marshy land area. Both *Lymnae* species are needed for the parasite s life cycle to be completed. According to Thomas (1883) and Brown (2005), the distribution of fasciolosis is associated with the favorable climatic and ecological conditions for development, spread and maturity of parasite and its lifecycle stages in various areas. In view of the worldwide spread, occurrence and zoonotic nature, fasciolosis has emerged as a major global and regional concern affecting all domestic animals and infection is most prevalent in regions with intensive cattle production (WHO, 2008). From the many parasitic problems of farm domestic animals, fasciolosis is the most important disease, which causes direct and indirect economic loss on livestock production, particularly of sheep and cattle (Keyyu *et al*., 2006). The disease is the major cause for the considerable economic losses in the cattle industry, mainly through mortality, liver condemnation, reduced production of milk, meat and expenditures for anthelmintics (Hillyer and Apt, 1997). Therefore, the objectives of this study were to assess the current on farm and abattoir prevalence of bovine fasciolosis and associated economic loss at robe municipal abattoir.

II. Materials and Methods

a) Study Area

The current study was conducted at robe municipal abattoir, from December 2016 to January 2017. Robe town is found in south eastern of oromia about 430 km from Addis Ababa, capital city of Ethiopia. Robe is located at $7^0 7'$N latitude and $40^o 0'$E longitudes and its altitude 2,492 meter (8,176) above sea level. The rainy season of the area is from April to September and the annual minimum and maximum temperature is 15^oc and 25^oc, respectively. Prevailing agricultural system is the main occupation of the area with integrated annual crop and livestock production in which oxen provides the power for ploughing smallholder's fields.

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b) Study Animals and Study Design

The study animals were cattle brought to the abattoir for slaughter from different localities around Robe town. A cross sectional active abattoir survey was conducted from December 2016 to January 2017 to assess the prevalence of Bovine fasciolosis and its economic losses at Robe abattoir, south eastern oromia.

c) Sample Size and Sampling Technique

The required minimum sample size was estimated using formula described by Daniel (1995) as follows: n = z2pexp (1-pexp)/d2 Where, n = required sample size; z = standard value; pexp = expected prevalence of bovine fasciolosis in the study area; d = desired absolute.

During ante-mortem examination, each of study animals were marked by color marker and their age, sex and body condition scoring was recorded. The age of the animals was determined according to their dentitions as described by Kelly (1975) and two age groups were considered as below and above five years. Body condition scoring was done according to Nicholson and Butter Worth (1986) and classified in to two categories; medium and good. During postmortem examination, liver and related bile ducts were carefully inspected by visual inspection, palpation and systematic incision for the presence of fasciola species (Getaw *et al.,* 2010). The Fasciola species were identified by their morphological features according to Urguhart *et al.,* (1996).

Assessment of direct economic losses due to liver condemnation was estimated based on annual slaughtered capacity of the abattoir, average market price of liver in the study area and rejection rate of liver or prevalence of the disease. The Annual slaughtered rate of the abattoir was estimated from retrospective abattoir record of the last years and average market price of liver was determined by interviewing personnel of the abattoir and butchers. The annual economic loss due to liver condemnation was estimated by the formula set by Ogunrinade and Ogunrinade(1980) as follows:

ACW = CSR XCL XBC X PX 126 Kg.

Where ACW = Annual loss from carcass weight reduction.

CSR = Average No cattle slaughtered per annual at the study abattoir.

CL= Carcass weight loss in individual cattle fasciolosis. BC = An average price of 1kg beef at Robe town, P=Prevalence rate of fasciolosis at the study abattoir. 126 kg = Average carcass weight of Ethiopian Zebu.

d) Statistical Analysis

Collected data were entered in to Microsoft excel and analyzed by SPSS version 16. Prevalence of bovine fasciolosis was calculated as the number of positive cattle divided by the total number of cattle examined. Chi square test was used to evaluate the association between bovine fasciolosis and host related factors like sex, age and body conditions. P - Value less than 0.05 was considered as statistical significant.

III. Results

A total of 502 indigenous cattle breeds that were slaughtered at Robe municipal abattoir were examined for the presence of fasciolosis. Among the examined animals, 345(68.72%) were positive for fasciolosis. Out of 345 livers positive for fasciolosis, 238 livers (68.98%) harbored *F. hepatica* and 107(31.02%) harbored *F. gigantica as shown* by Table 1 and 4. The highest (75.38%) prevalence was in young animals and the lowest (46.55%) was found in adult animals. Among eight different origins, no significant difference ($p > 0.05$) in the prevalence of bovine fasciolosis was observed. However, the prevalence of fasciolosis was highest (75.5%) in Alemgena area and the lowest (37.5%) prevalence was observed in Dinsho. There was a significant difference ($p < 0.05$) in the prevalence of bovine fasciolosis within different body conditions. The highest prevalence (70.37%) was found in animals with poor body condition and the lowest prevalence was found in good body conditioned animals (table 3). Among 502 cattle examined at Robe municipal abattoir, 487 were male, from these, 332(68.17%) were positive for fasciolosis and 15 of them were females which showed 13(86.67%) prevalence of fasciolosis(table 2).

Table 1: Prevalence of Bovine Fasciolosis by Age.

Age	Total animal examined	Prevalence
Young	386	291(75.38%)
Adult	116	54(46.55%)
Total	502	345(68.72%)

Table 2: Prevalence of Bovine Fasciolosis by Sex.

Sex	Total Animal Examined	Prevalence
Male	487	332(68.17%)
Female	15	13(86.67%)
Total	502	345(31.27%)

Table 3: Prevalence of bovine fasciolosis by body condition.

Body condition	Total animal examined	Prevalence
Poor	54	38(70.37%)
Good	448	307(68.52%)
Total	502	345(68.72%)

Table 4: Species of Fasciola identified during post mortem examination of slaughtered animals.

Species of Fasciola	No. of Liver Condemned	Percentage (%)
F.Hepatica	238	68.98
F.Gigantica	107	31.02
Total	345	100.00

Table 5: Prevalence of bovine fasciolosis by origin.

Origin	No. of animal examined	Prevalence
Agarfa	30	17(56.67%)
Alemgena	41	31(75.5%)
Ali	180	132(73.33%)
Dinsho	8	3(37.5%)
Gasara	32	22(68.75%)
Goba	31	22(60.97%)
Hisu	101	59(58.4%)
Robe	79	54(68.35%)
Total	502	345(68.73%)

Table 6: Percentage of degree of pathological lesion of infected liver

Degree of pathological lesion	No.of liver infected	Percentage (%)
Light(L)	57	16.52
Medium(M)	111	32.17
Severe(S)	177	51.30
Total	345	100.00

a) Economic Loss Assessments

Direct Economic loss

Direct economic loss was resulted from liver condemnation as the result of fasciolosis. Generally all infected livers with fasciolosis are unfit for human consumption. The 345fasciolosis infected livers of cattle were corresponding to an estimated total loss of about 14,225.04 ETB. In the study abattoir the average annual cattle slaughtered rate was estimated to be 3000 while mean retail price of bovine liver in Robe town as 60 ETB. Prevalence of fasciolosis in Robe municipality abattoir estimated as (68.72%). Therefore the estimated annual loss form organ condemnation is calculated according to the formula:

ALC = CSR X LC X P = 4000 X 60 ETB X 68.72% = 4000 X 60 ETB X 0.687 = 164,880 ETB

b) Indirect Economic loss

Indirect economic loss was due to carcass weight reduction as result of Fasciola infection. In the study area the average price of 1kg beef was 80 ETB. The annual economic loss from carcass weight reduction due to bovine fasciolsis is calculated by using the formula:

ACW = CSR X CL X BC X P X 126kg = 4000 X 10% X 80 ETB X 68.72% X 126kg

= 4000X 0.1 X 80 ETB X 0.6872 X 126kg = 2,770,790.4 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) and thus a total of 2,935,670.4 ETB (108,728.5 USD).

NB: 1 USD was equivalent to 27.00 ETB.

IV. Discussions

The present study revealed that overall prevalence of fasciolosis in the study area is 68.73%). Different findings on prevalence of fasciolosis have been reported from different parts of Ethiopia. Out of the studies carried, much higher prevalence of fasciolosis was reported from Gonder, Wondogenet, Jimma, Adwa and Hawassa municipality abattoirs (Yilma and Mesfin, 2000; Tilahun *et al*., 2006; Tolosa and Tigre, 2007; Bekele *et al*., 2010 and Rahmeto *et al.,* 2010).

Availability of moisture, optimal temperature and suitable snail habitat are among factors influence the occurrence of fasciolosis in a certain area (Urquhart *et al.,* 1996). An optimal temperature of 10 ^{o}C and 16^{o}C are necessary for snail vectors of *F. hepatica* and *F. gigantic* and for development of the *Fasciola* in the intermediate snail hosts. Moreover, such conditions are required for completion of the life cycle such as development of fluke eggs, miracidia searching for snails and dispersal of cercaria (Urquhart *et al.,* 1996).Variation of these environmental and ecological factors on different agro ecological zones leads to variation of the prevalence of fasciolosis from one study area to other localities.

Post mortem examination on the 502 *Fasciola* infected livers of current results indicated that the prevalence of *F. hepatica* (68.98%) was higher than that of *F. gigantic* (31.02 %). The high prevalence of *F. hepatica* may be associated with the presence of favorable ecological biotypes for its snail vector *Lymnaeatruncatula*.

The abattoir prevalence of the parasites in adult and young for *fasciola* was 54(46.55%) and 291(75.38%). This finding was higher than that of the study conducted by Abebe *et al.* (2011) with the prevalence of 30.04% and 35.97% in adult and young animals respectively. Even though such variation of the prevalence was exist it is not statistically significant (P>0.05).

The prevalence of the parasites in the different body condition of the animals was also determined and its prevalence for both *F.hepatica* and *F.gigantica* in poor body condition was 38(70.37%) but in that of good body condition animals it was 307(68.52%). The current finding was higher for both *F.hepatica* and *F.gigantica* in animals having poor body condition 23.1% and 11.9% Mihreteab *et al.* (2010). This might be due to the fact

that animals with poor body condition are usually less resistant and are consequently susceptible to infectious diseases. Even though, the prevalence in the different body condition of the animals was varied it was not statistically significant (P>0.05).

The total annual economic losses encountered due to condemnation of infected liver in Robe town were calculated as 164,880 ETB ($6,106.7). The present finding is by far lower than the results reported by Daniel (1995) who reported a total economic loss of 215,000 ETB ($2,891,025 and $4,031.250) annually in cattle due fasciolosis at Dire Dawa municipal abattoir. These higher values may be due to higher number of animals slaughtered at the Diredawa abattoirs. The ecological conditions and the number of intermediate host found around the area may also be another factor contributing to the decrement of the economic loss.

V. Conclusions

The present study revealed that although a moderate prevalence of bovine fasciolosis in the study sites recorded; the prevalence was significantly affected by sex, age and body condition of the animal. Higher prevalence of bovine fasciolosis was recorded in females cattle than males and in younger cattle (> 3 yrs) than older (> 5 yrs) ones. F. hepatica was found to be the predominant. facsiola species causing bovine fasciolsis in the study Finally the total annual economic losses due to bovine fasciolosis in the study abattoir from organ condemnation (direct loss) and carcass weight reduction (indirect loss) were high.

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