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An Exploration into Prevalence and Economic Significance of Bovine Fasciolosis at Jimma Municipality Abaittor

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Abstract

A cross sectional study was conducted on 384 cattle to determine the prevalence of bovine fasciolosis and to estimate the economic losses due to liver condemnation at Jimma municipality abattoir from March to May 2011. Post-mortem examination of liver was used to determine the prevalence. Out of the 384 adult indigenous cattle examined, 161 were found to be positive for fasciola with prevalence of 41.92%. F. hepatica was found to be the most prevalent liver fluke (19.27 0 o), affecting cattle slaughtered in the study area; whereas *F. gigantica*, unidentified or immature forms of fasciola species and mixed species identified were 10.93%, 6.7700 and 4.94 °o respectively. The economic losses due to liver condemnation as a result of fasciola infestation was assessed and found to be an average of 419.27 and 127,013.18 Ethiopian birr per day and annum respectively. In general, it can be concluded that bovine fasciolosis is one of the major obstacles for livestock development in the study area by inflicting remarkable economic losses. Therefore, appropriate control measures need to be envisaged to reduce the impact of the disease.

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Keywords

Cattle; Prevalence; Post-mortem; Bovine fasciolosis and Economic losses.

Introduction

Ethiopia has the largest livestock inventories in Africa, including more than 52 million cattle, 33 million sheep, 30 million goats and 2. 5 million camels (CSA, 2010) and it is the largest in Africa. Livestock and their products are the major foreign exchange earners, only second to coffee, with hides and skins contributing the most (Zewdu 1995; MEDC 1998). However, each year a significant loss results from death of animals, inferior weight gain, condemnation of edible organs and carcass at slaughter, This production loss to the livestock industry is estimated at more than 900 million USD annually (Abebe, 1995; Joberg *et al.*, 1996). Bovine fasciolosis is an economically important parasitic disease of cattle in tropical and subtropical countries which limits productivity. It is caused by fasciolidae, which are trematodes of the genus fasciola. The two most important species of this genus are *Fasciola hepatica* and *Fasciola gigantica*. Apart from its veterinary and economic importance throughout the world, fasciolosis has recently been shown to be a re-emerging and widespread zoonosis affecting a number of human populations (Mas-Coma and Bargues, 1997; Esteban *et al.*, 2003).

Among many disease, fasciolosis is one of the most important parasite diseases of cattle and sheep causing mortality and production losses in many parts of Ethiopia. Fasciolosis stands one of the priority parasitic diseases in the high land area in many of the regional state of the country (Aragaw, 1998). The disease occurs in areas of water logged and marshy grazing posture.

Fasciolosis is an endemic disease known to prevalence in the Northern parts of the country, particularly in areas along the Abay (Blue Nile) river basin (Mulualem, 1993). It is also highly prevalent in the highland and lowland areas of Oromia Regional States (Takele, 1995).

Fasciolosis caused by F. hepatica and F.gigantica is one of the most prevalent helminthes infection of ruminants in different parts of the world including Ethiopia. It causes significant morbidity and mortality (WHO, 1995; Okewole *et al.*, 2000). F. hepatica and F. gigantica occur in relatively cooler highland, semi highland and lowland areas respectively, where the intermediates are abundantly available during the wet seasons (Urquhart er al., 1996).

The diagnosis of juvenile flukes which migrate through the liver parenchyma is not possible via routine laboratory procedures, Fasciolosis occurs commonly as a chronic disease in cattle and the severity often depends on the nutritional status of host (Graber, 1978). It is responsible for a widespread morbidity and mortality especially in cattle and sheep characterized by weight 1088, anemia and hypoproteinemia (Yadete, 1994). The effect can also be expressed in terms 0f liver Condemnation at slaughterhouses, reduction in traction power and low weight at birth (Njau and Scholtens, 1991; Ngatejize *et al.*, 1993). Estimate of its prevalence rate in the tropical livestock suggests that infection rate is between 30% and 90% which is common in endemic areas of east, west and central Africa (Chiejina, 1994).

Fasciola hepatica is 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 county. The distribution of *F. giganticais* mainly localized in the western humid zone of the country that encompasses approximately one fourth of the nation (Malone *et al.*, 1998). A number of 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 infections and expense due to control measures (Malone *et al.*, 1998).

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 work so far conducted in Ethiopia reported variable prevalence rates of bovine fasciolosis in different localities of the country. The economic losses due to fasciolosisare caused by mortality, morbidity, and .reduced growth rate, condemnation of liver, increased susceptibility to secondary infections and the expense of control measures (Malone *et al.*, 1998).

A rough estimate of the economic 'loss due to decreased productivity caused by bovine fasciolosis is about 350 million birr per annual (Bahiru and Ephrem, 1979). The annual loss due to endoparasites in Ethiopia is estimated to be 700 million Ethiopian birr / annum (Mulugeta *et al.*, 1989). According to the study conducted by Tadele and worku (2007) and Fufa *et al.*, (2009), fasciolosis caused an average loss of 6300USD and 4000USD per mum at Jimma and Soddo municipal abattoirs. Abdul (1992) and Daniel (1995) also indicated that a total economic loss of about 154,188 and 215,000 Ethiopian birr per annum in cattle were reported due to fasciolosis at Ziway and Dire Dawa municipal slaughter houses respectively.

Diagnosis is based primarily on clinical signs, seasonal occurrence, previous history of fasciolosis on the farm or the identification of snail habitats; postmortem examination, hematological tests and examination of feces 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 (Urquhart *et al.*, 1996).

Therefore, the objectives of the study were:

To determine the prevalence of bovine fasciolosis based on postmortem examination.
To estimate economic losses due to liver condemnations in Jimma municipal abattoir.

Materials and Methods

Description of the study area

The study was conducted in Jimma zone, Southwestern part of Ethiopia at Jimma municipal abattoir. Jimma town, the capital of Jimma zone is located in Oromia Regional Administration, 346 km Southwest of Addis Ababa at latitude of about 7013'-8056' N and longitude of about 35052'~37037' E and at an elevation ranging from 880 m.a.s.l to 3360 m.a.s.l. The study area receives a mean annual rainfall of about 1530 mm which comes

from the long and short rainy seasons. The annual mean minimum and maximum temperature during the study period were 14.4 °C and 26.7 °C respectively.

Study population

The study population included local breeds of cattle in which 384 adult male animals were randomly selected to determine the infection prevalence rate and to estimate economical losses due to bovine fasciolosis. All these animals were brought for slaughter from different localities in the southwestern part of Ethiopia.

Study design

The study design was cross sectional study type with systematic random sampling which was conducted for animals slaughtered from March to May 2011 at Jimma municipal abattoir to determine the prevalence and economical 103865 0f bovine fasciolosis by using post-mortem examination of liver of each slaughtered animal in particular data analysis. During the study special attention was given to the livers of the animals and liver of each slaughtered animal was carefully examined by visualization and palpation of the entire organ that is followed by transverse incision of the organ across the thin left lobe in order to confirm the 0333 0" the problem (Soulsby, 1982; Urquhart *et al.*, 1996). Species identification or the recovered fasciola was also performed (based on the morphological features of the agents) and classified in to *F. hepatica, F. gigantica* unidentified or immature forms and mixed *species* of liver fluke (Urquhart at 01., 1996; Soulsby. 1982).

Study methodology

Data collection

The data recorded on specially designed forms and preliminary analysis done by Microsoft Excell ® (2003)Appropriate data was collected by using post-mortem examination of the organs so far claimed to be infected by fasciolosis (Thrusfleld, 1995).

Statistical analysis

Prevalence of fasciolosis was calculated as the number of cattle found to be infected with fasciola, expressed as a percentage of the total number of cattle slaughtered (Thrusfleld, 1995). The economic significance of the problem was analyzed based on the information obtained during interview and was calculated using the formula set by (Ogunirade 1980): Annual cost of condemned liver =NALX CL X % con

Where NAL=average number of cattle slaughtered at Jimma municipality abattoir per year. CL=Mean cost of one liver at Jimma town
% con=Percentage of livers condemned due to fasciolosis.

Sampling method and sampling size

Systematic random sampling technique was used to select the animals. To determine the sample size, fasciolosis prevalence 46.58% (Tadele and Worku, 2007) was taken in consideration. The desired sample size was decided by using the formula given by Thrusfield (1995) with 95% confidence interval. Expected prevalence was 50% and at 5% absolute precision. From the calculation, 384 cattle were used after two cattle were added to increase the precision.

Therefore, a sample size of 384 cattle was considered for this study

$$n=\frac{1.96^2 P_{exp}.(1-Pexp)}{d^2}$$

Where:
n = required sample size
P_{exp} = expected prevalence
d = desired absolute precision

Results and Discussions

Post mortem examination

The study was conducted during the months of March to May, 2011. Post-mortem examination to assess the prevalence and economical losses due to contaminations of liver of bovine fasciolosis infected animals was carried on 384 adult male indigenous cattle slaughtered at Jimma municipality abattoir. Out of the 384 cattle slaughtered, 161 cattle were positive for fasciolosis, giving a prevalence of 41 .92% (Table 1).

Identification of Fasciola species

From a total of 161 livers found positive for fluke infection during post-mortcm inspection of slaughtered animals, 74 livers (l9.27%) harbor Fhepatica, 42 livers (10.93 %) harbour *F. gigantica*, 26 livers (6.77%)

harbour mixed infection and 19 livers (4.94 %) infected with unidentified species of immature flukes (Table 2).

Economic loss analysis

According to one year data collected by Jimma municipality abattoir, average number of animals slaughtered per day was 40 and average price of one liver at Jimma town was about 25 ETB. Prevalence of condemned liver was 41.92%; therefore a total annual loss due to fasciolosis as a result of condemnation of infected livers was calculated. Thus, bovine fasciolosis caused loss of an average of 419.27 and 127,013.18 Ethiopian birr per day and annum, respectively at Jimma municipality abattoir.

Table.1 Monthly prevalence of Fasciolosis at Jimma Municipal Abattoir

Month	Liver examined	Condemned	Percentage (%)
March	106	50	13.02%
April	197	72	18.75%
May	81	39	10.75%
Total	**384**	**161**	**41.92%**

Table.2 Prevalence of Fasciola species encountered

Species	No of condemned livers	Percentage
F.hepatica	74	19.27
F.gigantica	42	10.93
Immature	26	6.77
Mixed	19	4.94
Total	**161**	**41.92**

Fasciolosis in Ethiopia is a widespread ruminant health problem and cause of significant economic loss to the livestock industry. As reported by Brook *et al.,* (1985), water logged and poorly drained areas with acidic soils in the high lands are often endemic areas for fasciolosis. The existence of permanent surface water which is more frequently seen in the high lands is also associated with high infection fascioiosis prevalence (Scott and G011, 1977; Brook *et al.,* 1985; Asegde, 1990).

The prevalence and economical importance of fasciolosis in different parts of the world has reviewed by different researcher including (Richter *et al.,* 1999). In Africa many researchers recorded a prevalence rate of 26.5% in Egypt and in Nigeria (Grev, 1993).

One of the most important factors that influence the occurrence of fasciolosis in an area is availability of suitable snail habitat (Urquhart *et al.,* 1996). In addition, optimal base temperature to the level of 10°C and 16°C are necessary for snail vectors of *Fhepatica* and *F. gigantica* respectively. These thermal requirements are also needed for the development of fasciola within the snail. The ideal moisture conditions for breeding and development of larval stages within the snail are provided when rain fall exceeds transpiration and field saturation is attained. Such conditions are also essential for the development of fluke eggs; miracidiae searching for snail and dispersal of cercariae (Urquhart *et al.,* 1996). The result obtained (41.92%) in this study area revealed that prevalence of bovine fasciolosis is high in indigenous cattle of the area. Bahru and Ephrem (1979) indicated the existence of fasciolosis in almost all regions of Ethiopia. In the current study, the prevalence (41.92 %) was similar with the results 47.5 % and 46.58 % reported by Zewdu (1991) and Tadele and Worku (2007) at Jimma municipal abattoir, and with the 413% Wondoson (1990), 49% Abdul (1992) and 47% Abduljebar (1994) at Arsi, Soddo and Bale municipality abattoir.

The result (41.92 %) was relatively higher as compared with the prevalence reported by Getu 18.06%, Dagne (1994), 14.4%; Fufa *et al.,* (2009), 14%; Hailu (1995),

28%; Wakuma (2009), 30.43%; Hagos(2007), 32.8 %; Dessie (1992), 32.62 %; Daniel (1995),14.8% in Wolaita, Dire Dawa, Soddo, Awassa, Bedele, Mekelle, Assela and Dire Dawa municipality abattoir respectively and (31.5%) at Kombolcha industrial abattoir (Nuraddis *et al.,* 2010). Unlike to the above, the result (41 92%) obtained in this Study area is lower when compared with previous reports in different parts of the country by Bahru and Ephrem (1979) in Keffa (86%), Roman (1987) in Notth Gondar (75%), Dagne (1994) in Debre Birhan (88%), Yadeta (1994) in western shoe (85.4%), Yohannes (1995) in Bahir Dar (84%) and Mulualem (1993) in South Gonder 83.08% at municipal abattoirs and Kombolcha industrial abattoir (Mulugeta, 1993) with prevalence 0f 81.6%. These differences are probably due to the agro-ecological and climatic differences between the study areas. Moreover differences in the management systems can also be source of different infection prevalence for bovine fasciolosis.

Of the total slaughtered animals, 41.92 % of them were found to be positive for bovine fasciolosis within their livers. Infection by *F. hepatica, F. gigantica*, immature or unidentified form of fasciola species and mixed infection were recorded to be 19.27 %, 10.93%, 6.77 % and 4.94 % respectively. Similar study conducted at Bedele and Jimma municipal abattoir and Kombolcha industrial abattoir reported 63.3%, 64.5% and 63.6% of liver harbored with F. hepatica; 23.85%, 24.8% and 24.3% of liver harbored with *F. gigantica*; and 11.93%, 10.7%, 5% harbored with immature or unidentified form of fasciola species as recorded by Tadele and Worku (2007), Wakuma (2009) and Nuraddis *et al.,* (2010) respectively and 4.94 % of mixed infection was recorded in the later study. The highest prevalence rate of F hepatica may be associated with existence of favorable ecological biotypes for *L. trancatula*. 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, middle altitude zone, flood prone areas, drainage ditches which are favorable habitat to *L. natalensis* (Urquhart *et al.,* 1996). This result was not in agreement with the finding of Fufa *et al.,* (2009) with the highest prevalence of F. gigantica in Soddo municipal abattoir. Graber and Daynes reported that in Ethiopia F. *hepatica* and *F. gigantica* infection occur in areas above 1800 mas]. and 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)Relatively small proportion of cattle were found infected with F. gigantica alone or mixed infection with both species.

Relatively high prevalence of Fasciola infection was analyzed from the data recorded by the abattoir. This may be attributed to infections acquired during previous peak snail activity season. In addition, the existence of permanent suitable ecological conditions in area like no acidic low-lying swampy or marshy areas with small Streams, springs, blocked drainage or relatively high prevalence of Fasciola infection was analyzed from the data recorded by the abattoir. This may be attributed to infections acquired during previous peak snail activity season. In addition, the existence of permanent suitable ecological conditions in area like nonacidic low-lying swampy 0r marshy areas with small streams, springs, blocked drainage or spillage from, for example, water troughs may contribute to persistent but relatively low infection during dry season (Radostits *et al.,* 2000).

The total economic loss encountered due to condemnation of fasciola infected liver at Jimma municipal abattoir was estimated to be 127013.18 Ethiopian birr annually. This finding is by far higher than the result reported previously by Tadele and Worku (2007) a total economic loss of about 55,080.00 Ethiopian birr per annum at the same study site. This difference is probably due to the rise of liver price during the current study period at Jimma town. 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 abattoir and loss of livestock production (Graber, 1978). Economic analysis reported from other parts of the country includes, Wondwosen (1990) in Arsi (159,704 ETB), Adem (1994) in Ziway (154,188 ETB), Hagos (2007) in Mekele (266,741.37) and Wakuma (2009) in Bedele (304,000 ETB), Yilma (1983) in DebreZeit (560,679 ETB), Daniel (1995) in Dire Dawa (215,000). These results indicated that bovine fasciolosis cause significant losses in different parts of Ethiopia at large.

Conclusion and recommendations

This study indicated that bovine fasciolosis is an important disease causing production losses. Currently, the disease was identified to be with high prevalence. It also revealed that, prevalence of fasciolosis was high. Both species of fasciola were identified and F. hepatica was the dominant species identified. The disease at Jimma municipal abattoir was continued to induce

economic losses due to liver condemnation. Higher prevalence rate of Fasciolosis could be due to increased irrigated land masses, animal grazing pastures are scarce, around marshy and swampy areas of the study area. In general, it can be concluded that bovine fasciolosis is one of the major obstacles for livestock development in the study area by inflicting remarkable economic losses.

From the above conclusion, the following recommendations are forwarded:

Strategic anthelmintic treatment with appropriate flukicidal drugs should be practiced

A combination of control measures including drainage, segregation of stock from source of infection; fencing and application of mulluscicides 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 intermediate host are useful in planning and programming control strategies.

For effective control of the disease, further researches must be conducted especially on eradication of intermediate host.

Finally, farmers should be aware of the nature of the diseases, its economic importance, control programs and management system.

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