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Prevalence of Fasciolosis in Cattle Slathered at Hosanna Municipal Abattoir, Southern Ethiopia

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Abstract

Fasciolosis caused by Fasciola hepatica and Fasciola gigantica is a zoonotic helminth infection of ruminants and causes of an important economic loss. The cross-sectional study was conducted from Dcember 2015 to September 2016 at Hossana municipal abattoir to determine the prevalence of fasciolosis and associated risk factors of bovine fasciolosis. In this study, 384 study animals were selected by random systematic sampling techniques for postmortem examination. The overall prevalence of bovine fasciolosis in the study was 117 (30.47). The prevalence of *Fasciola hepatica* was 68(58.12%) which was followed by *Fasciola gigantica* was 29(24.79%) and 20(17.09%) animals were mixed infected. The infection rate of bovine fasciolosis on abattoir study was significantly associated ($p<0.05$) with origin, breed, age and body condition of study animals. However, there was no statistically significant association of bovine fasciolosis with sex of cattle ($p>0.05$). This study shows that a higher 65(43.33%) prevalence was found in Gombora which was followed by Morisito 30(24.19%) and Jajura 22(20%). The highest 109(32.83%) prevalence was in local breed animals and the lowest 8(15.38%) was found in cross breed animals. It was noticed that a higher (37.5%) prevalence rate was identified in young than adult (33.3%) cattle. Cattle with thin body condition were higher 55(51.88) infection rate than medium 38(28.02%) and fat 24(18.18%). The predominant Fasciola species identified was Fasciola hepatica (55.6%) followed by Fasciola gigantica (19.6%). Difference in prevalence among geographical locations is attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature.

Keywords: *Abattoir; Cattle; Fasciola gigantica; Fasciola hepatica; prevalence*

1. Introduction

Ethiopia owns huge number of ruminants having high contribution for meat consumption and generates cash income from export of live animals, meat, edible organs and skin. In spite of the presence of huge ruminant population, Ethiopia fails to optimally exploit these resources due to a number of factors such as recurrent drought, infrastructures problem, rampant animal diseases, poor nutrition, poor husbandry practices, shortage of trained man power and lack of government policies for disease prevention and control (International Livestock Research Institute (ILRI), 2009).

Among the animal diseases, fasciolosis is an important parasitic disease of domestic ruminants caused by digenean trematodes of the genus *Fasciola* commonly referred as liver flukes. The two species most commonly implicated, as the etiological agents of fasciolosis are *Fasciola hepatica* and *Fasciola gigantica* (Lotfy *et al*., 2002).

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 (Brown, 2005).

Fasciola is commonly recognized as liver flukes and they are responsible for wide spread of morbidity and mortality in cattle characterized by weight loss, anemia and hypoproteinemia, reduced production of meat, milk, and wool, and expenditures for anthelmintics. The total global economic loss attributed to fasciolosis has been estimated earlier to be more than US$3 billion per year (FAO, 1994).

In the Ethiopian highlands, fasciolosis is also major health problem and causes production losses in domestic ruminants. Highland regions of the country contain pockets of waterlogged marshy areas that provide suitable habitats year round for the snail intermediate hosts (Brook *et al.,* 1985). Both *F. hepatica* (high land) and *F. gigantica* (low land) type of liver flukes cause severe losses in Ethiopia where suitable ecological conditions for the growth and multiplication of intermediate host snails are available (Anne and Gary, 2006).

A review of available literature strongly suggests that fasciolosis exists in almost all parts of the country. It is regarded as one of the major setbacks to livestock productivity, incurring huge direct and indirect losses in the country. Hossana is one of the areas where the environmental conditions and altitude is conducive for the occurrence of fasciolosis. However, little information is available about its prevalence in the study area. Therefore, the objective of this study were: to determine the prevalence of bovine fasciolosis and to determine the risk factor of bovine fasciolosis in Hossana municipal abattoir.

2. Materials and Methods

2.1. Study Area

The study was conducted at Hossana municipal abattoir of Hadiya Zone, Southern Ethiopia. Hadiya Zone is one of the 13 Zones in the southern Nation Nationalities of Ethiopia. The highest altitude in the Zone is 2970 m.a.s.l at the Summit of Sengiya Mountain in the Duna district and the lowest is 800 m.a.s.l in Gibe River valley. The zone is divided into ten districts and one city administration. Hossana is one of ten administrative town found in Hadiya zone and located at a distance of 230 km in the North East from Addis Ababa and 187 km from Hawassa, the capital city of the region. According to the information obtained from Hadiya Zone Agricultural Office, mixed farming system (livestock and crop production) is widely practiced. The district consists of 35 Peasant Associations and has a total of 137, 889 cattle population of which 12,066 cattle are found in the study areas. The study area located approximately at an altitude of 2200 m.a.s.l with the mean annual rainfall of 1172.75 mm and mean annual temperature of 18^{o}c. Geographically, it is located between 70.42 - 7.75^{o} N latitude and 370.80 - 38.07^{o} E longitude (HZSA, 2010).

2.2. Study Animals

The study animals comprised of cattle slaughtered at Hossana municipal abattoir. A total of 384 cattle were inspected during ante mortem and post mortem inspection with their identification numbers and recorded accordingly on a format prepared for this purpose.

2.3. Sample Size and Sampling Method

The sample size was determined by simple random sampling method using 95% confidence interval. To a date, there was no earlier work done on bovine fasciolosis at the study area. Therefore, the sample size was determined by taking the prevalence of 50% fasciolosis using the formula given by Thrusfield (2005).

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

Therefore, N = 384 cattle

Where N = sample size, P = expected prevalence, d = desired level of precision.

2.4. Study Design

Three days visit was made for ante-mortem examination and post-mortem examination of slaughtered cattle. Information was collected about the animals' origin from butchers. In particular, age, sex, breed, origin, and body condition of each individual cattle was recorded. Body condition scoring of the cattle was made based on the method described by Nicholson and Butterworth (1986). Each scoring were given number from 1(L-, very lean) to 9 (F+, very fat) and these scores finally included under three body condition scores, good, medium and poor (Table 1). The age of the animals was estimated by means of their dentition as described by Kelly (1975).

2.5. Postmortem Examination

A total of 384 cattle identified during antemortem inspection were examined through inspection and systematic incision of bile duct to recover adult *Fasciola* species. A collection of *Fasciola* species from each cattle was examined macroscopically using their morphological features (Urquhart *et al.*,1996).

2.5.1. *Fasciola* Species Identification

After collecting the flukes in the universal bottle containing 5% formalin as a preservative, *Fasciola* species were easily identified based on morphological characters such as shape, size. They were classified as *Fasciola hepatica* (relatively small sized), *Fasciola gigantica (*relatively large sized and more leaf like), mixed forms (*Fasciola hepatica* and *Fasciola gigantica*) and undifferentiated or immature forms of *Fasciola* species (Urquhart *et al*.,1996).

2.5.2. Types of Infection

The types of infection are classified as *Fasciola hepatica, Fasciola gigantica*, mixed Fasciola species (*Fasciola hepatica, Fasciola gigantica*) and juveniles.

2.6. Data Analysis

All raw data generated from this study were coded and entered in Micro Soft Excel spread sheet for data analysis; SPSS software version 20 was used. Descriptive statistics was used to determine the prevalence of the parasite and Chi-square ($\chi 2$) test was used to assess the association of the prevalence of fasciolosis and its associated risk factors such as sex, age, breed and body condition score of the animals. Statistical significance was set at $P < 0.05$.

3. Results

A total of 384 local and cross cattle breeds that slaughtered at Hossana municipal abattoir were examined for the presence of fasciolosis. Among the examined animals, 117 (30.47%) were positive for fasciolosis. Out of 117 livers positive for fasciolosis, 68 livers (58.12%) harbored *F. hepatica*, 29 (24.79%) harbored *F. gigantica* and the remaining 20 livers (17%) harbored mixed infection of *Fasciola* (Table 1).

Table 1. Prevalence of fasciolosis in slaughtered cattle at Hossana municipality abattoir by fluke species during study periods.

Species of *Fasciola*	Number of positive livers	Prevalence (%)
F. hepatica	68	58.12
F. gigantica	29	24.79
Mixed infection	20	17.09
Total	117	100

Out of 150, 124 and 110 cattle examined in Gombora, Morisito and Jajura, 65(43.33%), 30(24.19%) and 22(20%) were found to be positive for fasciolosis, respectively. There was statistically significant ($P = 0.026$) association in prevalence of fasciolosis among different study location of cattle examined (Table 2). There was a statistically significant difference ($p = 0.002$) in the prevalence of bovine fasciolosis between breed groups. The highest 109(32.83%) prevalence was in local breed animals and the lowest 8(15.38%) was found in cross breed animals (Table 2).

As the shown in Table 2, from the total of 370 male and 14 female cattle examined, 113(30.54%) and 6(28.57%) were positive for fasciolosis, respectively. There was no significant association ($p = 0.442$) between prevalence of fasciolosis and sex of study animals. There was a statistically significant difference ($p = 0.018$) in the prevalence of bovine fasciolosis in different age groups considered. The highest 21(58.33%) prevalence was in young animals and the lowest 96(27.59%) was found in adult animals. The prevalence of fasciolosis has only significantly associated with body condition of the cattle ($p < 0.05$).

Table 2. The effect of risk factors on the occurrence of fasciolosis in cattle slaughtered at Hossana municipal abattoir during study period.

Variables	No. examined	No. examined	Prevalence (%)	χ2	P-Value
Origin					
A	150	65	43.33	7.245	0.026
B	124	30	24.19		
C	110	22	20		
Breed					
Local	332	109	32.83	8.932	0.002
Cross	52	8	15.38		
Sex					
Male	370	113	30.54	0.618	0.442
Female	14	4	28.57		
Age					
Young	36	21	58.33	10.816	0.018
Adult	348	96	27.59		
Body condition score					
Poor	106	55	51.88	72.345	0.001
Medium	146	38	28.02		
Good	132	24	18.18		
Total	384	117	30.47		

4. Discussion

The overall prevalence of bovine fasciolosis (30.47%) observed in this study is in close agreement with the report of Rahmeto (1992) around Wolliso, who reported a 34% prevalence. However, it is much lower than that of many other studies from different abattoirs in the country and elsewhere in Africa. Yilma and Mesfin (2000) reported a 90.7% prevalence of fasciolosis in cattle slaughtered at Gondar abattoir, while Tolosa and Tigre (2007) recorded a prevalence of 46.2% at Jimma abattoir. Phiri *et al.* (2005) from Zambia and Pfukenyi and Mukaratirwa (2004) from Zimbabwe reported 53.9 and 31.7% prevalence, respectively. On the other hand, a lower prevalence of fasciolosis (14.0%) has been observed in slaughtered cattle at Wolaita Soddo abattoir (Abunna *et al.*, 2009). 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). 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.

Postmortem examination of the infected livers revealed that the dominant species that causes fasciolosis in the study area were *F. hepatica* (58.12%), *F. gigantica* (24.79%) and mixed infection (17.09%). In support of the present study, similar study in Gonder, Jimma, Mekelle and Adwa, *F. hepatica* was identified as the dominant species that causes fasciolosis (Yilma and Mesfin, 2000; Tolosa and Tigre, 2007; Gebretsadik *et al.*, 2009; Bekele *et al.*, 2010). This was associated with the existence of favorable ecological condition for *L. truncatula* (intermediate host of *F. hepatica* in the study area) such as swampy areas, small irrigation and marshy areas in the low lying plain area and temporary shallow ponds. The infection of cattle with *F. gigantica* and mixed infection with both species in the present study could be due to the reason that the cattle slaughtered in the abattoir were originated from lowlands and middle altitude zone flood prone areas, drainage ditches which are favorable habitat to *L. natalensis* (Urquhart *et al*., 1996).

The highest prevalence of fasciolosis was recorded in Gombora (43.33%) peasant associations followed by Morisito (24.19%) and Jajura (20%). Accordingly, the occurrence of bovine fasciolosis in Gombora was the highest when compared to Morisito and Jajura has more appropriate environmental conditions for the occurrence of intermediate hosts including flooded natural pastures, watershed areas, slowly flowing waterways and rivers for the presence of relatively more infection rate of fasciolosis in cattle. The finding of the present study was in agreement with the earlier findings by Torgerson (1999), who reported that the interaction of various environmental factors that increase the likelihood of fasciolosis in cattle and causes variation of infection rate between the localities.

The infection rate in local breeds (32.83%) was higher than cross-breed (15.38%), this could be due to differences in the management practices of the farmers. The local breeds are reared under traditional husbandry system and farmers give more attention to cross-breed than local breeds because of their production differences. Though the number of animals sampled under crossbreed was very small, similar result supporting the present finding was reported by Dejene (2008) and Wondwossen (1990).

In the present study, the prevalence of fasciolosis in cattle was not affected by sex of the animals. This is in agreement with several previous reports in different parts of the countries (Keyyu *et al.*, 2005; Kabir *et al.*, 2010; Kanyar *et al*., 2010; Khan *et al.*, 2010). This could be associated with similar management given to both male and females cattle. In communal grazing areas, both females and males graze on the same pasture and move in searching of food and water together, which expose to the same risk of infection. Moreover, it might also be that fasciolosis is not a disease directly related to animal reproductive system. However, in the study, the number of male cattle examined was higher than the female cattle. These female cattle may not have been adequately represented in the study.

The result of this study indicated that younger cattle (37.5%) were more affected as compared to adults (33.3%). The present finding was in line with previous studies by Mufti (2011) from Pakistan region, Keyyu *et al*. (2003) from southern highlands of Tanzania, Nganga *et al*. (2004) from area of Kenya, who reported that there was an age difference in the prevalence of fasciolosis. The possible explanation might be younger cattle were more susceptible and less resistant to infection of fasciolosis than adults. Hence, young animals with weak and less developed immunity were more likely to be affected by fasciolosis than adult animals in which acquired immunity was well developed through repeated challenge of the disease (Mungube *et al*., 2012).

In the present study, animals with lean body condition were associated with higher infection than animals with medium and fat body condition. Similar finding was also reported by Bekele *et al.* (2010). This implies that fasciolosis causes emaciation of the animals. Low body condition score was associated with liver fluke infection. However, other than fluke infection, inadequate nutrition and concurrent infection of the animals with other bovine pathogens could enhance the effects of the flukes for the emaciation of the animals.

5. Conclusion and Recommendations

The outcome of this study confirmed that, bovine fasciolosis was prevalent parasitic disease of cattle in the study area. The study indicates that fasciolosis affects the health and productivity of animals. Post mortem examination on the 117 *Fasciola* infected livers of current results indicated that the prevalence of *F. hepatica* (58.12%) was higher than that of *F. gigantic* (24.79%). The high prevalence of *F. hepatica* may be associated with the presence of favorable ecological biotypes for its snail vector *Lymnaea truncatula*. The infection prevalence of fasciolosis has an association with location, breed, age and body condition of the animals. However, it has not association with sex of the animals. The occurrence of bovine fasciolosis in this study suggested that there was the presence of favorable ecological and climatic conditions for the development and survival of the *Fasciola* species as well as intermediate hosts in the study area.

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

- Animal should be treated twice a year in the rainy season and long dry season as animals could get infection when they graze in marshy areas during dry periods.
- Strict ante mortem and post mortem inspection procedures should be made mandatory.
- Drainage of swampy areas which are favourable for snail multiplication should be control by snail control methods.
- Other control options should be also considered such as preventing susceptible animals to infection prone areas, feeding herbages which have been harvested from areas free of the parasite.
- Supplementary feeding of animals should be recommended to improve the body condition of the animals to adapt the damage caused by the flukes.

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