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Prevalence and economic significance of bovine fasciolosis in Nekemte Municipal abattoir

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A cross-sectional study was carried out from November, 2011 to March, 2012 at Nekemte municipal abattoir to assess prevalence and economic significance of bovine fasciolosis. Out of 384 cattle examined at post mortem, 21.9% (84) 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 medium and 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 14.1% (54), which was predominant among *Fasciola* species, causing bovine fasciolosis in the study areas. Whereas, the prevalence of *Fasciola gigantica* was 5.2% (20), and 2.6% (10) animals were mixed infected. 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 63072 ETB annually.

Key words: Cattle, economic significance, *Fasciola gigantica*, *Fasciola hepatica*, prevalence, post mortem examination.

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 that hinder the animal health, parasitic infections have a great economic impact, especially in developing countries. Fasciolosis is one of the most common economically important parasitic diseases of domestic livestock, particularly in cattle and sheep. The disease is caused by digenean trematodes of the genus *Fasciola*, commonly referred to as liver flukes. The two species most commonly implicated as the etiological agents of fasciolosis are *Fasciola hepatica* and *Fasciola gigantica. F. hepatica* has a worldwide distribution but predominates in temperate zones while *F. gigantica* is found on most continents, primarily in tropical regions (Andrews, 1999). 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 (Graber, 1978; Bahiru, 1979; Yilma and, 2000; Rahmeto et al., 2009).

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. Nekemte is one of the areas where the environmental conditions and altitude is conducive for the

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occurrence of fasciolosis. However, little information is available about its prevalence and economic significance in the study area. Therefore, the objective of this study was to determine the prevalence of bovine fasciolosis and to assess the direct economic loss due to liver condemnation in Nekemte municipal abattoir during November, 2011 to March, 2012.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Nekemte Municipal abattoir from November, 2011 to May, 2012. Nekemte is found in East Wollega zone, Oromia regional state, Ethiopia. It is located at 331 km west of Addis Ababa at latitude and longitude of 90° 5' N and 360° 33' E, respectively with an elevation of 2,088 meters above sea level. The minimum and maximum annual rain fall and daily temperature ranges are between 1450 to 2150 mm and 15 to 27°C, respectively.

Study animals

The study animals comprised of cattle slaughtered at Nekemte 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.

Sample size and sampling method

The sample size was determined by simple random sampling method using 95% confidence interval and calculated by using the formula given by Thrusfield (1995), with 5% absolute precision and at 50% expected prevalence.

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

$$\text{Therefore, } N = \frac{1.96^2 (0.5) (1 - 0.5)}{(0.05)^2}$$

= 384 cattle

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

Study design

Active abattoir survey was conducted based on cross sectional study during routine meat inspection on randomly selected cattle slaughtered at Nekemte municipal abattoir from November, 2010 to March, 2011.

Study methodology

The liver of each study animal was carefully examined for presence of lesions suggestive of *Fasciola* infection externally and sliced for confirmation. Liver flukes were recovered for differential count by cutting the infected liver into fine, approximately 1 cm slices with a sharp knife. Each mature fluke was identified to species level according to its shape and size. Investigation and identification of *Fasciola* was done according to their distinct morphological characteristics following the standard guidelines given by Urquhart et al. (1996).

Economic loss assessments

Generally, all infected livers with fasciolosis were considered to be unfit for human consumption and if any liver was infected by *Fasciola* at the Nekemte municipal abattoir, it was totally condemned. Economic losses were calculated based on condemned livers due to fasciolosis. In the study abattoir, the average annual cattle slaughtered rate was estimated to be 7,200, while mean retail price of bovine liver in Nekemte town was 40ETB. The prevalence of bovine fasciolosis in Nekemte municipal abattoir was estimated as 21.9%. The estimated annual loss from organ condemnation is calculated according to mathematical computation using the formula set by Ogunrinade and Adegoke (1982):

$$ALC = CSR \times LC \times P$$

Where ALC = Annual loss from liver condemnation, CSR = mean annual cattle slaughtered at Nekemte municipal abattoir, LC = mean cost of one liver in Nekemte town, P = prevalence of bovine fasciolosis at Nekemte abattoir

Data management and statistical analysis

The data which were recorded during the study period were entered into Microsoft excel sheet. Data were summarized and analyzed using statistical package for social sciences (SPSS) version 16 computer program. The Pearsons chi-square (X^2) test at a significance level of 5 and 95% CI was used to determine the differences in the prevalence of fasciolosis infection among different species, between ages and among body conditions of cattle, sheep and goats. A 5% significant level was used to determine the differences in the prevalence of fasciolosis infection among different species of ruminants, between ages and among body conditions. The difference was considered as statistically significant if the p-value was less than 0.05.

RESULT

Post mortem examination

A total of 384 indigenous cattle breeds that were slaughtered at Nekemte municipal abattoir were examined for the presence of fasciolosis. Among the examined animals, 84 (21.9%) were positive for fasciolosis. Out of 84 livers positive for fasciolosis, 54 livers (14.1%) harbored *F. hepatica*, 20 (5.2%) harbored *F. gigantica* and the remaining 10 livers (2.6%) harbored mixed infection of *Fasciola* (Table 1). There was a statistically significant difference ($p < 0.05$) in the prevalence of bovine fasciolosis in different age groups considered. The highest (31.78%) prevalence was in young animals and the lowest (18.05%) was found in adult animals. Among five different origins, no significant difference ($p > 0.05$) in the prevalence of bovine fasciolosis was observed.

Table 1. Prevalence of fasciolosis in considered risk factors.

Factors	No. of animals examined	Number of positive cases	Percentage (%)
Age			
Adult	277	50	18.05
Young	107	34	31.78
Origin of the cattle			
Nekemt	106	24	22.64
Amoma	61	13	21.31
Diga	89	15	16.85
Uke	59	14	23.73
Bandira	69	18	26.09
Body Condition			
Poor	97	36	37.11
Medium	170	35	20.58
Good	117	13	11.11
Sex			
Male	375	82	21.87
Female	9	2	22.2

However, the prevalence of fasciolosis was highest (26.09%) in Bandira area and the lowest (16.85%) prevalence was observed in Diga. There was a significant difference ($p < 0.05$) in the prevalence of bovine fasciolosis within different body conditions. The highest prevalence (37.11%) was found in animals with poor body condition and the lowest prevalence was found in poor body conditioned animals. Among 384 cattle examined at Nekemte municipal abattoir, 375 were male, from these, 82 (21.87%) were positive for fasciolosis and 9 of them were females which showed 22.22% (2) prevalence of fasciolosis.

Economic loss assessments

The annual loss from liver condemnation in Nekemte was estimated to be 63072 ETB ($1,182,600).

DISCUSION

The overall prevalence of bovine fasciolosis (21.9%) observed in this study is in close agreement with the report of Berhe et al. (2009) from northern Ethiopia, who reported a 24.3% 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). However, the prevalence of fasciolosis recorded in this study is higher than that reported in Diredawa municipal abattoir (14.4%) (Daniel, 1995). Difference in prevalence among geographical locations is attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature. *Fasciola* spp. prevalence has been reported to vary over the years mainly due to variation in amount and pattern of rainfall.

The result of present study revealed that the sex of the animal has no significant effect ($p > 0.05$) on the occurrence of bovine fasciolosis. This agrees with the report of Rahamato et al. (2009) who concluded that sex has no impact on the infection rate and hence both male and female are equally susceptible and exposed to fasciolosis. But this contradicts with the work of Balock and Arthur (1985) who reported that the effect of sex on the prevalence of bovine fasciolosis might be attributed to management system, with longer exposure of male outdoor when females are kept indoor at beginning of lactation.

The result of present study showed that age has significant effect on the prevalence of bovine fasciolosis; being higher in young animals than the adult ($p < 0.05$). There was a decrease in infection rate (prevalence) as age increased. This may be due to the result of acquired immunity with age which is manifested by humoral immune response and tissue reaction in bovine liver due

to previous challenge. There are some additional reports confirming that the increased resistance against fasciolosis (low prevalence) with age is most likely related to the high level of tissue reaction seen in bovine liver. Liver fibrosis which impedes the passage of immature flukes acquired thickening, stenosis and calcification of bile ducts, assumed unfavorable site for adult parasites and consequently fasten their expulsion. These are in agreement with experimental study conducted by Radostits et al. (1994) which confirmed the occurrence of higher infection rate in younger animals. The results of the present study indicated that body condition of the animal has significant association with the occurrence of fasciolosis. The prevalence was higher in poor body conditioned animals than that of medium and good body conditioned animals. The prevalence of fasciolosis was higher in the animals with poor body condition because this body condition in cattle is manifested when fasciolosis reaches at its chronic stage.

Post mortem examination on the 84 *Fasciola* infected livers of current results indicated that the prevalence of *F. hepatica* (14.1%) was higher than that of *F. gigantic* (5.2%). The high prevalence of *F. hepatica* may be associated with the presence of favorable ecological biotypes for its snail vector *Lymnaea truncatula*.

The total annual economic losses encountered due to condemnation of infected liver in Nekemte town were calculated as 63072 ETB ($1,182,600). The present finding is by far lower than the results reported by Abdul (1992) and Daniel (1995) who reported a total economic loss of 154,188 and 215,000 ETB ($2,891,025 and $4,031,250, respectively) annually in cattle due fasciolosis at Ziway and Dire Dawa municipal abattoir, respectively. These higher values may be due to higher number of animals slaughtered at the Diredawa and Ziway 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.

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