International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2021; 6(6): 54-58

www.veterinarypaper.com
Received: 07-10-2021
Accepted: 09-11-2021

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Epidemiology of Fasciolosis in cattle in selected districts of bale zone, south eastern Ethiopia

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DOI: https://doi.org/10.22271/veterinary.2021.v6.i6a.471

Abstract
A cross-sectional study was conducted from December 2021 to September 2022 with the aim of determining the prevalence of bovine fasciolosis and assessing its associated risk factors in Dello Mena town municipal abattoir, Dello Mena district, south- Eastern Ethiopia. Postmortem examination was used as diagnostic tool for this research to detect any adult Liver fluke found in bile ducts of the slaughtered cattle. A total of 400 randomly selected indigenous and cross breed cattle slaughtered during the study period were examined and 192 of them were found to be positive for one or both of the fasciola species. *Fasciola hepatica* was the most prevalent species with the prevalence rate of 53.64% (103) followed by *F. gigantic* and mixed infections with the prevalence rate of 40.1% (77), and 6.25% (12) respectively. There was statistically significant difference (p<0.05) among the different species of *fasciola* in the positive animals. In the study, different variables or associated risk factors such as age, body condition and sex of the study animals where considered. There were no statistically significant differences (p>0.05) in the prevalence of the parasite among those associated risk factors. Finally, in the present study higher prevalence of bovine fasciolosis was obtained when compared with the prevalence reported by different researchers at different areas of the country. Therefore, strictly different measures should be practiced in the study area to control the parasite and thereby it is possible to avoid its negative impacts in the animals.

Keywords: Bovine, fasciolosis, prevalence, dello mena abattoir

Introduction

Materials and Methods

Description of the study area

Study Area and duration

The present study was conducted in Bale zone namely Dello-Mena woreda of the Oromiya Regional State, Southeast of Ethiopia about 430 KMS away from Addis Ababa. The altitude of the study area ranges from 850 to2800 M.A.S.L, where the lowland area predominates with a narrow strip of high land area in the Northern part of Delo-Mena district. The area experiences a bimodal rainfall occurring from September to November and March to June. An average annual temperature of 20- 25 °C and rainfall of 200mm are recorded. The vegetation of the area changes with altitude ranging from scattered trees and bushes in the low land to dense woody forest area in the high land. The study area is endowed with several rivers, many perennial rivers flow across the districtr namely: Welmel, Yadot, Erba-1, Erba-2, Deyu, Denda and Doya. The rivers and other deep wells, ephemeral ponds, lakes, piped water supply and seasonal streams are sources of water for livestock and people. According to the basic livestock information record carried out by Delo Mena woreda livestock and fishery resource Development office in 2019 G.C, the livestock population of the area comprises of 671,727 Bovine, 12,991 Ovine, 781,121 caprine, 5432 equines, and 31070 poultry and the woreda has one municipal abattoir where slaughtering and meat inspection of beef cattle only is carried out. Among Dello-Mena district communities, most of them are pastoralists and others have an agricultural vocation and a mixed farming system with crop-livestock production (BZANRO,

2020) [9]. The study was conducted from December 2021 to September 2022

Study population

A total of 400 indigenous cattle are slaughtered at Dello Mena municipal abattoir, provided for slaughter from different localities in the district were included cattle slaughtered in the abattoir were brought from different markets which in turn are provided from different livestock markets in their vicinity.

Study design, sampling and sample size determination

A cross sectional study was carried out December 2021 to September 2022 by collecting data on events associated with fascioliasis on cattle slaughtered at Dello Mena municipal abattoir. The study was made on the slaughtered cattle at abattoir by the regular visiting. During abattoir survey includes both ante mortem and postmortem examination.

The sample size was calculated according to (Thrustfield 2005) by considering estimated prevalence of 50% since there was no previous abattoir survey conducted in the study area. The sample size calculated was 384 with 95% confidence interval and 5% expected error. However, in order to increase the precision, a total of 400 cattle were examined at Dello Mena Municipal abattoir by using systemtic sampling method. Here is the formula

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

When

n = required sample size

Pexp = expected prevalence

d = desired absolute precision.

Hence, by using this formula, the sample size was calculated.

Study methodology

Ante mortem inspection and Postmortem examination

Ante mortem examination was performed a few hours before slaughtering from randomly selected cattle. The age, body condition, sex and general health condition of the animals were properly recorded. Each animal was identified based on the enumerate marks on its body tagged before slaughter. The age of the cattle was estimated based on dentition. The body condition of each cattle also was scored before slaughtering of the animal according to (Nicholson and Buttrworth, 1986) [34]. Information regarding age, sex and body condition of the study animals was recorded during ante-mortem examination. The liver of each study animal was carefully examined through palpation and incision on each liver and bile duct for presence of lesions indicative of Fasciola infection externally and sliced for confirmation. Then, positive livers with adult parasites were collected.

Species identification

For species identification, the flukes were collected by using different universal bottle containing 5% formalin as a preservative, and brought to Delo Mena veterinary clinic and species were easily identified based on morphological characters such as shape, size. Based on Urquhart *et al*., 2017 [55] they were classified as *Fasciola hepatica* (relatively small sized), *Fasciola gigantica* (relatively large sized and more leaf like), mixed forms (both adult and immature *Fasciola hepatica* and *Fasciola gigantica*).

Data management and Statistical analysis

The raw data was entered and managed in micro soft excel work sheet and descriptive statistic is utilized to summarize data. Statistical analysis was done using SPSS version 20 statistical software. Prevalence fasciolois infection with age, sex and body condition was calculated by descriptive statistics as percentage value. The prevalence of Fasciolosis is calculated as the number of cattle found to be infected with *Fasciola* expressed as percentage of the total number of cattle Slaughtered.

Results

Overall prevalence of fasciolois

In this study, a total of 400 livers of local breed cattle were inspected by using post mortem examination for bovine fasciollosis during the study periods. In this study a total of 400 cattle were examined and the result revealed that 48% (192/400) were positive as shown in the table (Table 1)

Table 1: Overall abattoir level prevalence of bovine fasciolosis in the study area

Total number of animal / liver examined	Total Number of animal infected	Prevalence (%)
400	192	48

Prevalence by age

The age wise prevalence of Fasciolosis was 41.7%, 46.5% and 52.8% in >5, 3-5, <3 years, respectively but the difference was not statistically significant (p>0.05) (Table 2)

Tables 2: The prevalence of bovine Fasciolosis in different age groups

Age in year	No. of liver examined	No of positive cases	No of negative cases	Prevalence %
<3	106	56	50	52.8%
3-5	198	92	106	46.5%
>5	96	40	56	41.7%
Total	400	188	212	49.5%

Prevalence by sex

The prevalence of Fasciolosis was 40.9% and 18.18% in male and female respectively.

Table 3: Prevalence of bovine Fasciolosis based on sex bases

Sex	No of liver Examined	No of liver Positive	No of liver negative	Prevalence%
Male	367	150	217	40.9%
Female	33	6	27	18.18%
Total	400	156	244	39%

Fasciola species identification

From 400 livers examined, 192 livers (48%) found positive. For fluke infection during Post-mortem inspection of slaughtered animals 103 (53.64%) livers harbored *F. hepatica*, 77 (40.1%) livers harbored *F. gigantica* and 12 livers (6.25%) infected with unidentified species due to immature fluke.

Table 4: Species of *Fasciola* encountered in affected livers

Fasciola	No. of positive livers	Prevalence (%)
F. hepatica	103	53.64
F. gigantica	77	40.1
Mixed form	12	6.25
Total	192	48

Discussion

The overall prevalence of bovine fasciolosis (48%) observed in this study is in close agreement with the reports of Shiferaw *et al*. (2011) [48] who reported the prevalence of 45.25%, in in around Assela, Tolosa and Tigre (2007) [54] recorded prevalence of 46.2% at Jimma abattoir and Chamiso (2020) [12] recorded 46.87% in municipal abbatoir of mudulla, Tembaro woreda. 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) [59] reported 90.7% prevalence of fasciolosis in cattle slaughtered at Gondar abattoir and Phiri *et al*. (2005) [45] from Zambia reported prevalence of 53.9%. 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), and Gebretsadik *et al*. (2009) and Nuraddis *et al*. (2010) who reported prevalence of 24.3% and 28% at Mekelle area and at Kombolcha Industrial Abattoir, Ethiopia, at Wolaita Sodo Municipal Abattair (20.24%) (Adane *et al*., 2019) [5] and Pfukenyi and Mukaratirwa (2004) from Zimbabwe and 31.7%, respectively. 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.

In the present study, species identification revealed that *Fasciola hepatica* was more prevalent (53.64 %) than *Fasciola gigantica* (40.1 %) and mixed infections (6.25 %). unlike the present study, Genet *et al*. reported that 56.42 % of cattle were infected with *F. hepatica* and 9.17 % with *F. gigantica*. in other study, Fufa et al. 2009 [1] stated that the most common Liver fluke species affecting cattle at welaita sodo were *F. gigantica*. However; Gebretsadik *et al*., reported that 56.42 % of cattle were infected with *fasciola hepatic*a and 9.17 % with *F. gigantica*. malone and yilma indicated that *F. gigantica* in Ethiopia is found at altitudes below 1800 meters above sea level. Mixed infections by both species can be encountered at 1200 – 1800 meters above sea level.

According to malone and yilma such discrepancy is attributed mainly to the variation in climatic and ecological conditions such as altitude, rainfall and temperature as well as Livestock management systems.

The prevalence rate of fascioliasis based on the sexes of the slaughtered cattle was statistically significant (p> 0.05), this could be due to the exposure of male and female bovines to similar ecological condition and practices of similar management system without considering their sex. as it is indicated in table 3 the prevalence of bovine fascioliasis was 40.9 % and 18.18 % in male and female cattle, respectively. this was lower than the the finding of Feleke and Girma with 60.07 % in male and 66.67 % in female cattle at Debre Berehan municipal abattoir. However; it was higher than the finding of Yosef *et al*., at Bedelle municipal abattoir with the infection rate in the population of males was 20.88 % and in that of female was 20.79 %. this might be due to the economic importance given by the local society for female cattle by keeping in protected area and due to the reason that the abattoir rule prohibited to slaughter young fertile females without the permission of veterinary personnels.

The result of the current study showed that age has insignificant effect on the prevalence of bovine fascioliasis; but it was higher in young animals (62.26 %) than the adult (41.7 %). there was a decrease in infection rate (prevalence) as age increased. this agrees with the finding of Mohammed et al. 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 fascioliasis (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 also in agreement with experimental study conducted by Radiostits *et al*, which confirmed the occurrence of higher infection rate in younger animals.

In the current study, these were a statistically insignificant association (p> 0.05) between the different categories of body conditions of the animals and the prevalence of fasciola infection. Unlike the finding of the present study, a study conducted in Debre Berehan by Feleke and Girma indicated that the association between the prevalence of fascioliasis and body condition of the animals was also statistically significant. The result of present study showed that origin has also insignificant effect on the prevalence of bovine fascioliasis. This could be due to the similarities in the topographical locations of the study areas, epidemiology of the parasites and management factors.

Conclusion and Recommendations

Fasciolosis is a major disease which imposes direct and indirect economic impacts on Livestock production, particularly of sheep and cattle in Ethiopia. Some of the economic losses in the cattle industry induced by fasciolosis are; mortality, Liver condemination, reduced production (meat, milk) and expenditures of different cost for treatment, prevention and control. In this study higher prevalence of bovine fasciolosis was obtained when compared with the prevalences reported by different researchers at different area of Ethiopia. The dominant fasciola spesies revaled in the study area was *Fasciola hepatica* with the prevalence rate of 53.64 % and followed by Fasciola gigantica with the prevalence rate of 40.1 %. Those fasciola species had significant difference in their prevalence. In this study, different variable or associated risk factors were also considered, however, they were found to be statistically significant for the prevalence of bovine fasciolosis.

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

- Community based control programs or practices such as regular de - worming of animals, drainage of swampy area and fencing of watering points should be implemented in the study area.
- Building of dams at appropriate site in marshy and low laying area may reduce the snail problem.
- Further detailed epidemiological studies as well as assessment of the overall economic impact of the problem should be performed in order to implement appropriate disease investigation and control strategy in the district.

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