Prevalence of Bovine Fasciolosis and Its Associated Risk Factor in and Around Dangila District, Awi Administration Zone, Northwestern Ethiopia

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Abstract: A cross-sectional study was conducted to determine the prevalence of bovine fasciolosis and identify its associated risk factors in and around Dangila town, Awi administration Zone, North Western Ethiopia from November, 2014 to April, 2015. Parasitological examination of fecal sample collected from 384 cattle by using sedimentation method revealed an overall fasciolosis prevalence of (30.02%). Risk factors such as peasant association, body condition, breed and age showed a significant effect on the prevalence of infections (P<0.05). However, there was no statistically significant association of bovine fasciolosis with sex of cattle’s (p>0.05) in which 26.4% and 33.4% prevalence were recorded, respectively. It was noticed that a higher prevalence rate was identified in adult age (49.0%) than young (22.3%) and old age (16.1%) and higher indigenous local breed (34.3%) than cross breed cattle (14.1%). Infection rate for cattle with poor body condition (38.7 %) was higher than cattle with medium (38.7 %) and good body condition (21.5 %). This result also showed the difference of the prevalence among the different body condition was statistically significant (P<0.05). The results demonstrated in four PAs that Fasciola infection was higher in Zelesa (38%) followed by Girargie (34%), Dengeshta (29.3%) and Kebele 02 (18.4%), respectively. There was statistically significant variation in the prevalence of bovine fasciolosis (P<0.05) among the different peasant associations. The current finding showed fasciolosis was the most common and economically important parasitic disease affecting cattle in the study area hence, control strategies should be designed to minimize the prevalence of the infection.

Key words: Cattle • Coprology • Dangila • Fasciolosis • Prevalence • Risk Factor

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa, of roughly 53.99 million animals out of this total cattle population, the female cattle constitute about 55.48% and the remaining 44.52% are male cattle [1], however, this great potential is not properly exploited as a result of disease, malnutrition and other management problems. Parasitism is one of the major bottle necks to livestock development in the tropics [2]. 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 [3]. Fasciolosis is of economic importance in cattle and sheep, but it may infect all domestic animals, human and many of wild species [4]. The direct economic impact of fasciolosis infection is increased condemnation of liver meat, but the far more damaging effects are decreased animal productivity, lower calf birth weight and reduced growth in infected animals and cost of animal treatment [5]. The spread of fasciolosis is largely dependent on the ecology of the snails which act as intermediate hosts and the snails of genus Lymnaea are mainly involved as intermediate host in the life cycles. Lymnaea natalensis, aquatic snails is important for F. gigantica in Africa whereas L. truncatula, an amphibious snail with wide distribution throughout the world, is the most common intermediate host for F. hepatica. Temperature of 10 ºC or above is necessary for both snails to breed and for the development of parasite [6]. In Ethiopia, F. hepatica and F. gigantica infections occur in areas above 1800 m and below 1200 m.a.s.l, respectively which has been attributed
to variations in the climatic and ecological conditions such as rainfall, altitude and temperature and livestock management system. In between these altitude limits, both species coexists where ecology is conducive for both snail hosts and mixed infections prevail [7]. The life cycle of *Fasciola* species is typical of digenetic trematode which is characterized by indirect life cycles [8]. The highlands contain pockets of water logged marshy areas. These provide suitable habitats year round for the snail intermediate hosts. More rational prophylactic programs based on local epidemiological information are needed for sound fasciolosis control strategies in Ethiopia [7].

Therefore, the objectives of this study were:

- To estimate the prevalence of bovine fasciolosis in and around Dangila district.
- To identify the risk factors of bovine fasciolosis in the study area.

**MATERIALS AND METHODS**

**Description of Study Area:** The study was conducted from November, 2014 to April, 2015 in and around Dangila town, Awi administration zone in Amhara region, North West Ethiopia, which is located at about 485 kilometers away from Addis Ababa. The climatic condition alternate between along summer rain fall season (May-September) and a winter dry season (December-April) with a mean annual rain fall of and temperature is 1576 mm and 17°C, respectively. Geographically, the area lies between 11.3° latitude and 36.8° longitude with an elevation of 2200 m.a.s.l with Woina dega temperate climate.

**Study Procedure:** In the laboratory coproscopic examination were performed to detect the presence of *Fasciola* egg according to standard technique as described by Hansen and Pery [10]. Fresh fecal samples for parasitological examination were collected directly from the rectum of using disposable plastic gloves and placed in clean screw capped universal bottles. Each sample was labeled with date of submission, age, sex, body condition and place of origin. Samples were preserved with 10% formalin solution to avoid the eggs development and hatching. Age was classified as young (<2 years), adult (2-6) and old (>6 years) as described by De-Lahunta and Habel [11]. Samples that were not processed within 24 hour were stored in a refrigerator at 4°C until all are processed and examined. Sedimentation technique was used to detect fluke eggs in the fecal sample.

**Study Population:** The study animals were different breed of cattle in Dangla district. The animals in the study period were kept under extensive management system, of different age groups and body condition of both sexes.

**Study Design:** A cross-sectional study was conducted from November, 2014 to April, 2015 to determine the prevalence of bovine fasciolosis and associated risk factors in Dangila district.

**Sample Size and Sampling Method:** The animals were selected by using simple random sampling method, to determine the sample size; an expected prevalence of 50% was taken into consideration since there was no earlier coprological research work on fasciolosis in the area. The desired sample size for the study was calculated using the formula given by Thursfield [9] with 95% confidence interval and 5% absolute precision.

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

where,
- \(n\) = Sample size;
- \(P_{exp}\) = Minimum expected prevalence = 50%
- 1.96 = The value of z at 95% confidence interval
- \(d\) = Desired accuracy level at 95% interval.

Accordingly, 384 cattle were sampled from four selected peasant association of the study area owned by smallholder farmers.

**Data Management and Analysis:** The collected data was entered and stored into Microsoft Excel spread sheet 2007. The data were thoroughly screened for errors and properly coded before subjecting to statistical analysis. The data were imported from the Microsoft Excel and analyzed using Statistical Package for Social Sciences
(SPSS) software version 16.0. Descriptive statistics was used to determine the prevalence of fasciolosis and Chi-square (÷2) test was used to assess the association of the potential risk factors like age, sex, body condition, PA and breed for the occurrence of the fasciolosis. A 5% significance level was used to determine whether there are significant differences or not.

RESULTS

Fecal examinations showed that from 384 fecal samples examined in selected areas of smallholder farms in Dangila district for the occurrence of fasciolosis, 116 cattle were positive for *Fasciola* eggs, resulting in an overall prevalence of 30.02%. Sex of cattle was tested as a risk factor for fasciolosis; different level of prevalence 26.4% and 33.7% was detected in female and male cattle, respectively. However, there was no statistically significant difference (P > 0.05) in infection rates between the sexes as describe in Table 1.

The highest prevalence of fasciolosis was observed in adult age (49.0%) followed by young age (22.3%) and old age (16.1%). Significant difference was observed in the prevalence among different age groups (P<0.05) as shown in Table 2.

There was statistically significant differences between the local and cross breeds of cattle on the prevalence of fasciolosis on fecal examination results (P<0.05). Infection rate in local breeds (34.3%) was higher than cross breeds (14.1%) as shown in Table 3.

The body condition results indicate that there was statistically significant difference between cattle having good, medium and poor body condition (P>0.05), Higher prevalence of bovine fasciolosis was observed in poor body condition (38.6%) than medium (25.7%) and good (21.5%) body condition as described in Table 4.

There was statistically significant variation in the prevalence of bovine fasciolosis (P<0.05) among the different peasant associations in the study area. The highest prevalence was recorded in Zelesa (38.0%), while the lowest in kebele 02 (Table 5).

DISCUSSIONS

A total of 384 cattle were taken into consideration and coprologically examined from the selected areas of smallholder farms in Dangila district for the occurrence of fasciolosis, of which, 116 were found infected with fasciolosis, resulting in an overall prevalence of 30.02%.

### Table 1: Prevalence of fasciolosis in live cattle on sex wise

<table>
<thead>
<tr>
<th>Sex</th>
<th>Sample size</th>
<th>Positive</th>
<th>Prevalence (%)</th>
<th>X² (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>202</td>
<td>68</td>
<td>26.4</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>182</td>
<td>48</td>
<td>33.7</td>
<td>2.41 (0.120)</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>116</td>
<td>30.2</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Prevalence of fasciolosis in live cattle based on age groups

<table>
<thead>
<tr>
<th>Age</th>
<th>Sample size</th>
<th>Positive</th>
<th>Prevalence (%)</th>
<th>X² (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>94</td>
<td>21</td>
<td>22.3</td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td>147</td>
<td>72</td>
<td>49.0</td>
<td></td>
</tr>
<tr>
<td>Old</td>
<td>143</td>
<td>23</td>
<td>16.1</td>
<td>40.86 (0.000)</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>116</td>
<td>30.2</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: Prevalence of fasciolosis in live cattle based on breeds

<table>
<thead>
<tr>
<th>Breed</th>
<th>Sample size</th>
<th>Positive result</th>
<th>Prevalence (%)</th>
<th>X² (P-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>306</td>
<td>105</td>
<td>34.3</td>
<td></td>
</tr>
<tr>
<td>Cross</td>
<td>78</td>
<td>11</td>
<td>14.1</td>
<td>12.04 (0.001)</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>116</td>
<td>30.2</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4: Prevalence of fasciolosis in live cattle based on body conditions

<table>
<thead>
<tr>
<th>Body condition</th>
<th>Sample size</th>
<th>Positive result</th>
<th>Prevalence (%)</th>
<th>X² (P-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>168</td>
<td>65</td>
<td>38.6</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>109</td>
<td>28</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>107</td>
<td>23</td>
<td>21.5</td>
<td>10.64 (0.005)</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>116</td>
<td>30.2</td>
<td></td>
</tr>
</tbody>
</table>

### Table 5: Prevalence of fasciolosis in live cattle based on origins

<table>
<thead>
<tr>
<th>Origin</th>
<th>Sample size</th>
<th>Positive result</th>
<th>Prevalence (%)</th>
<th>X² (P-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 Kebele</td>
<td>87</td>
<td>16</td>
<td>18.4</td>
<td></td>
</tr>
<tr>
<td>Dengeshta</td>
<td>99</td>
<td>29</td>
<td>29.3</td>
<td></td>
</tr>
<tr>
<td>Girargie</td>
<td>106</td>
<td>36</td>
<td>34.0</td>
<td></td>
</tr>
<tr>
<td>Zelesa</td>
<td>92</td>
<td>35</td>
<td>38.0</td>
<td>9.19 (0.027)</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>116</td>
<td>30.2</td>
<td></td>
</tr>
</tbody>
</table>

The overall prevalence of bovine fasciolosis (30.02%) in the present study was agree with the earlier findings that was 30.05% by Bekele et al. [12] in Hossana municipal abattoir and close to (31.5%) the findings of Ayalew and Endalkachew [13] at Bahir dar municipal abattoir, North Ethiopia. However, the overall prevalence of bovine fasciolosis in the present study was lower than the previous findings of 50.98% by Dejene [14], 90.65% reported by Yilma and Mesfin [15] at Gondar abattoir and (46.58%) by Tadele and Worku [16] at Jimma municipal abattoir. But the present study in that area showed higher prevalence of bovine fasciolosis as compared to the 25.46% by Kahn et al. [24] and with the prevalence (22.14%) reported by Alemu and Mekonnen [17] in Dangila municipal abattoir. This great variability shown is probably due to the ecological and climatic differences between different locations throughout the country. One of the most important factors that influence the occurrence of fasciolosis is availability of the suitable snail habitat [6, 18].
The infection rate of bovine fasciolosis on the basis of breed showed statistically significant difference (P < 0.05). Infection rate in local breeds (34.3%) was higher than cross-breed (14.1%), 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 [14] and Wondwossen [19].

A prevalence of 16.9% and 39.7% was recorded in male and female animals, respectively. There was no statistically significant difference (P > 0.05) in infection rates between the sexes. Different results that contract the present finding were reported by Yehenew [20], Haymanot [21] and Abdu [22] revealed a higher prevalence in the male than female. This was probably related to the management system with longer exposure of male outdoor while females are kept in door during pregnancy and lactation.

Statistical analysis of infection rates based on age indicated a prevalence of 22.3%, 49.0% and 16.1% in young, adult and old age animals, respectively. There was significant difference in infection rates (P < 0.05) among different age groups. This might be due to the management system in which young’s graze in the field for short time, while adults kept indoor for beef lot purpose since their teeth wear ought they did not able to graze correctly. Nevertheless, adults graze morning to night in the field, this expose the animal for the parasite long time. In Ethiopia, some results reported that increase prevalence rates as age increases were reported by Wondwossen [19]. On the contrary, results indicating inverse correlation of prevalence rate and age of cattle were reported by Fekadu [23], Rahmeto et al [24] and Dagne [25]. This is the result of acquired immunity, which is manifested by humoral response and tissue reaction in bovine liver due to previous challenge Ogarinide and Adegoke [26].

In the current study, the association between the prevalence of fasciolosis and body condition of the animal was found to be statistically significant. The highest prevalence were recorded in poor body condition 38.7% than good body condition 21.5%, in support of this finding a study was done in Adwa by Mihretab et al. [27], in Welaya sodo by Edilawit et al. [28] and in Hosanna by Bekele et al. [19] revealed highest prevalence in poor body condition. The probable reason could be due to the fact that animal with poor body condition are usually less resistant and are consequently susceptible to various disease including fasciolosis and due to reduce performance of the animals created by luck of essential nutrients and poor management by owner.

Statistically significant variation in the prevalence of bovine fasciolosis (P<0.05) among the different localities in the study area was detected. The highest prevalence was recorded in Zelesa (38.0%) followed by Girargie (34.0%) and kebele 02. This is due to the highest level of stagnant water in Zelesa, which is favorable for snail intermediate host. But kebele 02 animals graze in Wasta level plain land with only small river basin.

CONCLUSION AND RECOMMENDATIONS

The present study conducted on bovine fasciolosis in and around Dangila district indicated that fasciolosis was highly prevalent parasitic disease affecting the health and productivity of animal with an overall prevalence of 30.02%. Body condition, age, breed and origin of the animals were important risk factors for the occurrence of bovine fasciolosis. The occurrence is closely associated to the presence of suitable environmental conditions for the development of snails. Draining of marshy areas, utilization of swampy areas for crop production and strategic deworming were recommended at the end of the study.

Therefore based on the current findings the following points are recommended:

- Awareness should be created among farmers about the disease prevalence and transmission.
- Veterinary service to be extended to the disease prevalent areas with provision of modern antihelmenthics for treatment of affected animals.
- Agriculture department should initiate actions for control of snails through drainage of stagnant water in swampy areas.
- Regular deworming of animals before and after the rainy season should be done.
- Applications of molluscides are important in the control of the intermediate hosts.
- Further epidemiological investigations should be initiated to assess the worm burden in Ethiopia to study the associated risk factors and indirect economic losses.
REFFERNCES


