Coprological Prevalence of Bovine Fasciolosis at Diga and Guto-Gida Veterinary Clinics, East Wollega, Western Ethiopia

Zelalem Abera, Tadele Kabeta, Beshatu Ferede, Mesele Alemayehu, Takele Engdaw, Felmata Kenei, Melkitu Gobena and Meseret Alemu

College of Medical and Health Sciences, School of Veterinary Medicine, Wollega University, P.O. Box: 395, Nekemte, Ethiopia

Abstract: Fasciolosis is an economically important parasitic disease, which caused by trematodes of the genus Fasciola that migrate in the hepatic parenchyma and develop in the bile ducts. A cross-sectional study was conducted from March to May, 2015 to determine the coprological prevalence of bovine fasciolosis at Diga and Guto-Gida Veterinary Clinics of East Wollega Zone. The study comprised of animal sex, age, management system and breed as the major variables and sedimentation techniques was used for examination during the study. A total of 206 randomly selected fecal samples were examined and 27(13.11%) of them were found to be positive for fasciolosis. This prevalence of coprological examination was comparatively higher in Diga 17(16.03%), than Guto-Gida 10(10%) district. However, there was no statistically significant difference (P>0.05) in infection rate between these districts. Highest (33.33%) and lowest (0%) prevalence were recorded in Diga Peasant Association (PA) of Diga district and Dalo and Negasa PAs of Guto-Gida district, respectively. The current finding revealed that, comparatively higher prevalence was recorded in female (15.18 %) than in male (10.64 %). However, no significant association (P>0.05; OR=2.5) was observed for sex groups. The result of the present study indicated that age had significant difference (P<0.05). This shows young aged animals were more likely to be affected more than two times by fasciolosis as compared to that of adult aged animals. In conclusion bovine fasciolosis were prevalent causing major economic losses in the study area. Hence, control strategies targeted on the parasite and the intermediate host as well as implementation of appropriate grazing management in the study area is warranted.

Key words: Bovine • Coporology • Diga • Fasciolosis • Guto-Gida • Prevalence

INTRODUCTION

Livestock contribute a direct role in generating food and income [1, 2] and serving as a valuable asset, store of wealth, collateral for credit and an essential safety net during times of crisis throughout the developing world [3-6] and generally generate a livelihood for 1.0 billion poor people in the world [7].

The livestock sector accounts for about 30% of the agricultural GDP in Sub-Saharan Africa (SSA) and nearly 60% of the value of edible livestock products is generated by cattle [8]. However, Ethiopia has high livestock population which provides draught power, milk, meat, fiber, fuel and fertilizer and foreign currency from hide and skin, our country is not using from her livestock as much expected due to production constraints circulating in animal population [9, 2]. These overall livestock production constraints in Ethiopia are feed and water shortages, livestock diseases, low genetic potential of indigenous livestock and lack of marketing infrastructure [10, 11].

Fasciolosis is a parasitic disease and one of the livestock diseases, affecting a wide range of mammalian species, including man. It is caused by Fasciola hepatica and F. gigantica. Fasciola species are of great importance in ruminants in which they inflict heavy economic losses [12, 13]. Fasciola is commonly recognized as liver flukes and are responsible for wide
spreading morbidity and mortality in cattle characterized by weight loss, anemia and hypoproteinemia. The two most important species are *Fasciola hepatica* found in temperate area and in cooler areas of high altitude in the tropics and subtropics and *Fasciola gigantica*, which predominates in tropical area [14].

This disease is one of the most prevalent helminth infections of ruminants in different parts of the world including Ethiopia [15, 16]. In cattle, it occurs commonly as a chronic disease and the severity often depends on the nutritional status of the host [17].

In Ethiopia, *F. hepatica* and *F. gigantica* infections occur in areas above 1800 m (high land) and below 1200 m (low land) above sea level, 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 [18, 19].

The geographic distribution of trematode species is dependent on the distribution of suitable species of snails. The genus *Lymnaea* in general and *L. truncatula* in particular is the most common intermediate host of *F. hepatica* and *L. natalensis* is intermediate host of *F. gigantica*. These species of snails were reported to have a worldwide and tropical distribution [20]. The presence of fasciolosis due to *F. hepatica* and *F. gigantica* at abattoirs in some parts of the country has long been known and its prevalence and economic significance have been reported variable prevalence rates of bovine fasciolosis in different locality of the country [21-23]. But there is still gap of information on the prevalence of the fasciolosis for many potential sites of the country to review country wide prevalence and economic significance. Therefore, the objective of this study is to determine coprological prevalence of bovine fasciolosis in Diga and Guto-Gida veterinary clinics.

**MATERIALS AND METHODS**

**Description of the Study Area:** The study was conducted in selected districts of East Wollega Zone specifically at Diga and Guto-Gida Veterinary Clinics from March to May, 2015 G.C. The districts are found in East Wollega Zone, Oromia Regional state of Ethiopia. It is located at 331 km West of Addis Ababa at latitude and longitude of 90° S’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°C to 27°C, respectively [24].

**Study Population:** The study comprised of cattle coming to Diga and Guto-Gida Veterinary Clinics. Both sexes, all age’s groups, local and cross breeds was included in the study population.

**Study Design:** A cross sectional study was conduct to determine the coprological prevalence of bovine fasciolosis at Diga and Guto-Gida Veterinary Clinics.

**Sample Size Determination:** The sample size was determined by simple random sampling method using 95% confidence interval and calculated by using the formula given by Thrusfield [25], with 5% absolute precision and based on the parameters of expected prevalence of 15.90% reported from Nekemte veterinary clinics [26]. Accordingly a minimal sample size required for the study was calculated to be 206 cattle.

\[
\begin{align*}
n &= \frac{1.96^2 \cdot P \cdot (1 - P)}{d^2} \\
&= \frac{1.96^2 \cdot (0.159) \cdot (1-0.159)}{(0.05)^2} = 206
\end{align*}
\]

Accordingly, faecal samples were collected from 206 cattle for to determine coprological prevalence of bovine fasciolosis.

**Sample Collection and Identification Methodology**

**Sampling Techniques:** The fecal samples were collected directly from the rectum of the animals in to a universal bottle containing 10% formalin and transported to Wollega University Veterinary Laboratory for Coprological examination. During sampling information on sex, breeds, an approximate age of individual animals were recorded. Age was classified as young (<4years) and adult (>4years) [27]. Samples those not processed within 24 hours were stored in the refrigerator at 4°C.

**Identification Methods:** Sedimentation technique was used to detect the presence or absence of fluke eggs in the fecal sample collected, as described by Atonia *et al.*
To differentiate between eggs of *Paramphistomum* and *Fasciola* species, a drop of methylene blue solution was added where eggs of *Fasciola* species show yellowish color while eggs of *Paramphistomum* species stain by methylene blue [29].

Data Management and Analysis: Data entry and management was made using Microsoft Excel sheets. Data analysis was made using Statistical Package for Social Science (SPSS) version 20 software.

Descriptive statistics such as percentages and frequency distribution was used to describe the nature and the characteristics of the data. The Odds ratio was calculated to see association of risk factors with the prevalence of fasciolosis. In all the analyses, confidence levels at 95% were calculated and a P<0.05 was used for statistical significance level

RESULTS

The study was conducted by collecting faecal samples from cattle coming to Diga and Guto-Gida Veterinary Clinics. To compare the prevalence of bovine fasciolosis at both districts, 106 and 100 samples were collected from Diga and Guto-Gida Veterinary Clinics, respectively. From a total of 206 examined bovine fecal samples, overall of 27 (13.1%) samples were positive for *Fasciola* eggs. But specifically out of 106 total fecal samples taken from Diga, 17(16%) of them were positive for *Fasciola* eggs and of 100 fecal sample collected from Guto-gida Veterinary Clinics 10(10%) samples were positive for *Fasciola* eggs. The result indicated that higher coprological prevalence of fasciolosis was recorded in animals came to Diga Veterinary Clinics as compared to that of Guto-gida Veterinary Clinics. However, there was no statistically significant difference (p>0.05) between both districts (Table 1).

Coprological Prevalences Based on Sex, Age, Breed and Management System: The prevalence of fasciolosis between female and male animals was studied and out of animals sampled, the majority (54.36%) were females while about 45.64% of them were males. The prevalence rates of fasciolosis were 15.18% and 10.64% in female and male, respectively (Table 2). However, there was no statistical difference (p>0.05) between the two sexes.

Analysis of age wise prevalence of fasciolosis indicated that the difference in prevalence among the two age groups were relatively high in young group (< 4 years of age) 18.89% than the adult age groups (≥ 4 years of age) 8.62% with statistically significant variation (P<0.05, OR= 2.468) (Table 2). The result showed young aged animals were more likely to be affected more than two times by fasciolosis as compared to that of adult aged animals.

Comparison was made between the breeds of animals and higher prevalence rate of fasciolosis (13.13%) was recorded in local breeds than in cross breeds (0%). However, there was no statistical difference (p>0.05) between the two breeds.

| Table 1: Comparasion of coprological prevalence of bovine fasciolosis at Diga and Guto-Gida Veterinary Clinics |
|---|---|---|---|---|
| Districts | Nº of examined animals | Nº of positive animals | Prevalence (%) | P-value |
| Diga | 106 | 17 | 16.037% | 0.203 |
| Guto-Gida | 100 | 10 | 10.0% | 0.034 |
| Total | 206 | 27 | 13.1% | 0.042 |
| 95% CI | Lower - Upper |
| 0.746 - 3.959 |

| Table 2: Prevalence of Bovine Fasciolosis based on Sex, Age, Breeds, Management System |
|---|---|---|---|---|---|
| Variables | Nº of examined | Nº of Positive and Prevalence (%) | P-value | OR |
| Sex | Male | 94 | 10(10.64) | 0.338 | 0.665 |
| Female | 112 | 17(15.18) | |
| Age | < 4 | 90 | 17(18.89) | 0.034 | 2.468 |
| ≥ 4 | 116 | 10(8.62) | |
| Breed | Local | 191 | 27(13.13) | 0.999 | - |
| Cross | 15 | - | |
| Mgt. system | Extensive | 186 | 26(13.98) | 0.042 | 3.087 |
| Intensive | 20 | 1(5) | |
| Total | 206 | 27(13.11) | |

203
Table 3: Prevalence of Bovine Fasciolosis based on Kebeles

<table>
<thead>
<tr>
<th>District</th>
<th>Kebeles (PAs)</th>
<th>N° of animals examined</th>
<th>N° of positive animals</th>
<th>Prevalence (%)</th>
<th>P-value</th>
<th>OR</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diga</td>
<td>Diga</td>
<td>9</td>
<td>3</td>
<td>33.33</td>
<td>0.765</td>
<td>0.6</td>
<td>0.047</td>
<td>9.472</td>
</tr>
<tr>
<td></td>
<td>Fromsa</td>
<td>22</td>
<td>2</td>
<td>10</td>
<td>0.380</td>
<td>3.3</td>
<td>0.226</td>
<td>49.093</td>
</tr>
<tr>
<td></td>
<td>Gemechis</td>
<td>21</td>
<td>3</td>
<td>14.28</td>
<td>0.597</td>
<td>2.0</td>
<td>0.153</td>
<td>26.187</td>
</tr>
<tr>
<td></td>
<td>Ifa</td>
<td>17</td>
<td>4</td>
<td>23.52</td>
<td>0.950</td>
<td>1.7</td>
<td>0.087</td>
<td>13.538</td>
</tr>
<tr>
<td></td>
<td>Jirata</td>
<td>22</td>
<td>3</td>
<td>13.63</td>
<td>0.569</td>
<td>2.1</td>
<td>0.162</td>
<td>27.582</td>
</tr>
<tr>
<td></td>
<td>Gadisa</td>
<td>21</td>
<td>2</td>
<td>13.33</td>
<td>0.576</td>
<td>2.1</td>
<td>0.143</td>
<td>32.528</td>
</tr>
<tr>
<td>Guto-Gida</td>
<td>Nekemte</td>
<td>63</td>
<td>8</td>
<td>12.69</td>
<td>0.495</td>
<td>2.2</td>
<td>0.212</td>
<td>24.801</td>
</tr>
<tr>
<td></td>
<td>Gari</td>
<td>19</td>
<td>1</td>
<td>5.26</td>
<td>0.246</td>
<td>6.0</td>
<td>0.290</td>
<td>124.100</td>
</tr>
<tr>
<td></td>
<td>Dalo</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0.998</td>
<td>0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negesa</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jiregna</td>
<td>4</td>
<td>1</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>206</td>
<td>27</td>
<td>13.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As the result revealed that an infection rate of bovine fasciolosis in the study was higher in an extensive management system (13.98%) than in an intensive management system (5%). The prevalence rate of bovine fasciolosis on the basis of management system showed significant difference (p<0.05, OR=3.087, CI=1.4-24.1).

On the other hand, the cattle of different Kebeles selected for the study that was six and five Kebeles (PAs) were involved in the study from Diga and Guto-Gida districts, respectively. Relatively highest prevalence rate (33.33%) record was observed in Diga Kebele of Diga district and lowest prevalence rates (0%) were recorded in Dalo and Negesa Kebeles of Guto-Gida districts. However, none of the Kebeles (PAs) considered in the analysis had significant effect on prevalence to bovine fasciolosis in the study area (Table 3).

**DISCUSSION**

The coprological study was carried out at Diga and Guto-Gida Veterinary Clinics of East Wollega Zones, Oromiya Regional State. From these sites high infection rate (16.04%) was encountered in Diga, while lower infection (10.0%) in Guto-Gida. However there was no statistical significance (p>0.05) between the two districts. The result of present study revealed that overall of coprological prevalence of bovine fascioliosis is (13.11%) and this result closely agreed with the finding of 26) from West Ethiopia who reported 15.90% prevalence.

The result of current study was very lower in the study area as compared to high prevalence of 86% in Keffa [30], 80% in and around Debre-Berhan [31], 36.72% around Bahir-Dar [32], 82.5% in Western Shoa [33], 80% in and around Debre-Berhan [31], 42.25% in and around Assela [34], 53.72% in Arsi Administrative Region [35] and 42.90% in Eastern Herarge [36] reported from different parts of the country. This might be due to agro-ecological zones of the study area; seasonal deworming, cultivation of harsh area and the present study were conducted during the dry period of the year when the infection rate of fasciolosis expected to be low. Additionally the availability of suitable snail habitats, temperature and moisture are the main factors influencing the production of the large numbers of metacercariae necessary for epidemiology of fasciolosis. Climatic factors are of supreme importance influencing epidemiology of Fasciolosis [37-40].

However, it was higher (13.11%) than that other study from different Veterinary Clinics in country. Prevalence of 4.9% bovine fasciolosis at Soddo and Kombolcha Veterinary Clinics was reported by Fufa et al. [41] and also Ibrahim et al., [42] recorded a prevalence of 12.4% at Kombolcha Veterinary Clinics. On the other hand, prevalence might be related to the variation in agro-climatic condition, management system, in the different Peasant Associations of the study area. Prevalence rates and epidemiology of disease vary significantly with locality and this attributed mainly due to the variation in the climate and ecological condition [43, 44].

In addition to clinical finding, on comparing with the studies at municipal abattoirs of the country, the present study was in agreement with the finding of [23] 14% at Wollitia-soddo abattoir and Daniel [45] 14.4% Dire-Dawa municipal abattoir. On the other way, the current study was lower than 60.2% around Bahir-Dar [46], 21.9% at Nekemte municipal abattoir [47].

Study was also conducted in age wise to observe prevalence of bovine fasciolosis and the result indicated that the difference in prevalence among the two age groups were relatively high in young group (< 4 years of age) 18.89% than the adult age groups (≥ 4 years of age).
8.62% with statistically significant variation (P<0.05, OR= 2.468). The result showed young aged animals were more likely to be affected more than two times by fasciolosis as compared to that of adult aged animals. This statistically significance difference might be due to grazing behavior of animals. Additionally the experimental result by Soulsby [48] and Blood and Radiostits [49] confirmed the occurrence of higher infection rate in younger animals. Furthermore, these were in agreement with the finding of Ogunrinade and Adegoke [50] who clearly justified that the decrease in infection rate (prevalence) as age increase was the result of acquired immunity which was manifested by humeral respond and tissue reaction in bovine liver due to the previous challenge. Also Soulsby [48] confirmed the occurrence of higher infection rate in younger animals. On the other hand, the result of current study disagreed with the report of Biniam, Hanna and Sisay [51] who suggested that age groups had no effect for the presence or prevalence of fascioli; hence, both animals were equally exposed to infection.

The prevalence of disease in female and male animals was recorded as 15.18% and 10.64% respectively. The result showed that, coprological prevalence of bovine fasciolosis was comparatively higher in female than in male animals of the study area. However, there was no statistical significance (p>0.05) between the two sex groups. This could be explained by fact that there was no difference in grazing behavior of animals between sex, the finding agreed with Tilahun et al.[26] who concluded that the sex had no impact on the infection rate and hence both male and female were equally susceptible and exposed to fasciolosis. However, this finding contradicted with work of Block and Arthur [52] who reported that the effect of sex on the prevalence of bovine fasciolosis might be attributed to management system with large exposure of male out door when females were kept in door at the beginning of lactation.

Also study was conducted in breeds of animals and the prevalence of disease in local and cross breeds was recorded as 13.13% and 0% respectively. This indicated that higher prevalence rate of fasciolosis was observed in local breeds than in cross breeds. However, there was no statistical difference (p>0.05) between the two breeds. This difference could be due to difference in the management practice of the farmers in which the local breeds are reared under traditional husbandry system and farmers gave more attention to cross-breed than local because of their production difference. Though the number of animals sampled under cross- breed was very small, similar result supporting the present finding was reported by Wondossen [35].

Comparison was also done between the management systems of the animals in the study area and the results indicated that prevalence rate of bovine fasciolosis was higher in an extensive management system (13.98%) than in an intensive management system (5%). The prevalence rate of bovine fasciolosis on the basis of management system showed significant difference (p<0.05, OR=3.087, CI=1.4-24.1). The results showed that animals within extensive management system were more likely to be affected more than three times by fasciolosis as compared to that of animals within intensive management system.

**CONCLUSION AND RECOMMENDATION**

The current study was carried out on coprological prevalence of bovine fasciolosis at Diga and Guto-Gida Veterinary Clinics. The results indicated that bovine fasciolosis was moderately distributed in the study areas with the overall prevalence of 13.10%. High prevalence rate was recorded in Diga district as compared with Guto-Gida Veterinary Clinics. The present study showed that coprological prevalence of bovine fasciolosis was comparatively higher in female than in male and also high in young than in adult groups of animals in the study area. The findings also indicated that higher prevalence rate of fasciolosis was observed in local breeds than in cross breeds. The coprological prevalence rate of bovine fasciolosis on the basis of management system and ages showed statistically significant difference.

Based on the above information the following recommendations are forwarded:

- Owners should be trained to improve the management system and to avoiding animals grazing from marsh lands which plays the major role to control fasciolosis in the study area.
- Strategic application of anthelimentics, eliminating the parasite from the host at the most appropriate time for effective prevention of pasture contamination and coupled with reduction of the number of intermediate host, snails by chemicals, drainage and other management practice.
- The owners should be used the planned grazing management to reduce the risk of infection especially during the high out break months and tethering the animals should be practiced in the study area.
Competing Interests: All authors have declared that no competing interests exist.

Authors’ Contributions:

ZA, TK and BF: Conception of the research idea, designing and data collection and interpretation and manuscript reviewing.
MA, TE, FK, MG and MA: Drafting the manuscript with ZA and TK
ZA: Interpretation of the results, drafting and reviewing of the manuscript with TK.
All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

We are very much grateful to the inhabitants of all staff members of Wollega University, College of Medical and Health Science, School of Veterinary Medicine and Diga and Guto-Gida Veterinary Clinic workers for their valuable advice, provision of materials and necessary supports during our work. Next to that, our sincere appreciation is extended for all staff of Veterinary Laboratories at Wollega University especially, Mrs. Demessa Negessu and Dereje Senbeta for their encouragements and co-operation in different aspects.

REFERENCES