The Prevalence of Bovine Fasciolosis (Study in Janamora Wereda)

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Abstract: A cross-sectional study aimed at estimating the prevalence and identifying Fasciola species on cattle in Janamora Woreda was conducted from November, 2018 to March 2019. The study was based on post-mortem inspection of livers in some slaughtered animals and coprological examination using sedimentation technique. The prevalence of Gasha Jagrie, Deresgie, Rob Gebeya, Denkolako, and Enchet Kab Kebeles are 53/148 (35.8%), 25/65 (38.5%), 16/44 (36.4%), 10/32 (31.2%) and 6/19 (31.6%) respectively. The sensitivity and specificity of sedimentation technique to diagnose Fasciola infection as compared to post-mortem inspection of liver was also determined. Out of 384 livers inspected, 134 (34.89%) were positive for Fasciola species. F. hepatica was found to be the most prevalent species 75 (55.97%) as compared to F. gigantica 24 (17.91%). Mixed infection with both species was observed in 12 (8.96%) animals and 23 (17.16%) cattle were infected with unidentified immature liver flukes. Likewise, out of 384 fecal samples examined 83 (21.6%) were positive for Fasciola eggs. On assessment for potential risk factors, age and origin, didn’t show significant association with the prevalence of infections (P>0.05). However, body condition revealed significant disparity (P<0.05) as greater magnitude of infections were detected in poor body condition of animals than medium and good body conditions. Besides, the sensitivity and specificity of the sedimentation technique as compared to postmortem finding was 61.9% and 100% respectively. It is concluded that fasciolosis, due to F. hepatica and F. gigantica, is prevalent in cattle in the study areas. Therefore, it is recommended that strategic control and prevention of the parasite should be implemented and further study on live animals of different age, species and breeds should be conducted. Furthermore, upon diagnosis of faciolosis epidemiological information about the disease with suggestive clinical examination should be considered even in the absence of Fasciola eggs during coprological examinations.

Keywords: Bovine, Fasciolosis, Prevalence, Janamora, Deresgie, Gasha Jagrie Kebele.

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, and shortage of trained man power and lack of government policies for disease prevention and control [1].

Among the animal diseases that hinder the animal health, parasitic infections have a great economic impact, especially in developing countries. Out of these parasitic problems of farm animals, fasciolosis is a major disease, which imposes direct and indirect economic impact on livestock production, particularly of sheep and cattle [2]. Fasciola hepatica and Fasciola gigantica are the two liver flukes commonly reported to cause fasciolosis in ruminants [3]. The infection is acquired through grazing on swampy pasture [4]. Acute fasciolosis often remains undetected in cattle and develops to the chronic form which makes them less resistant to other liver infections. Chronically infected cattle can show signs such as loss of condition, lethargy, anaemia, bottle jaw, sub-optimal growth rates, diarrhea, and metabolic disease and reduced milk yield in dairy cows, and reduced fertility. Signs are exacerbated by poor nutrition or gastro-intestinal parasitism [5].

Fasciola hepatica has a cosmopolitan distribution, mainly in temperate zones, while Fasciola gigantica is found in tropical regions of Africa and Asia. Thus, the two fasciolid 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 are distinct [5]. In developed counties, the incidence of F. hepatica can reach up to 77%. In tropical countries, fasciolosis is considered the single most important helminth infection of cattle, with reported prevalence of 30-90% [6]. The prevalence of fasciolosis in many parts of Africa has been determined mainly at slaughter; however, estimation of economic loss due to fasciolosis at national or regional level is limited by lack of accurate estimation of the prevalence of disease [7].

Therefore, the objective of this study was
a. To determine the prevalence of bovine fasciolosis
b. To identify fasciola species found in Janamaora Wereda.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted in Janamora Wereda Janamora Wereda is located in North Gondar Zone of Amhara region, at the latitude and longitude of 12°59’N 38°07’E at a distance of about 180km from Gondar town. Janamora Wereda is well-known with Semien mountain National Park, Ras Dashen i.e the highest point in Ethiopia and it is a home to a number of endangered species including the Ethiopian Wolf, walia ibex, and a wild goat which no found in elsewhere in the world. The area has an altitude range of 2900 meters above sea level. The region is marked by numerous mountains, hilly, and sloppy areas, plateaus, rivers, and many streams. Livestock population of the area comprises 100,386 cattle, 32,975 sheep, 131,041 goats, 2,540 horses, 634 mules, 7758 donkeys, 119,347 poultry. The farming system of the study area is characterized by a mixed crop-livestock production system. Transhumance, from the highlands to western lowlands, is practiced as an important strategy to secure grazing resources for the highland livestock during the dry season of the year. In the case of the lowlands, crop farming is not as intensive as high and mid-highland areas and livestock has larger contributions to the farmer’s livelihoods [8].

2.2. Study Animals

The study was conducted on cattle in Janamora Wereda. All cattle included in the study were male and local indigenous cattle. Sometimes it is difficult to trace the origin of the animals as they usually pass a chain of markets. Age of the animal was classified as adult and old. Those animals below 7 years old were categorized as adult while those animals above 7 years were classified as old [9]. Body condition was classified as poor, medium and good based on the standard described by Nicholson and Butterworth [10].
2.3. Sampling Method and Sample Size Determination

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 research work on fasciolosis in the area. The desired sample size for the study was calculated using the formula given by Thursfield [11] with 95% confidence interval and 5% absolute precision.

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

Where:
- \( n \): required sample size
- \( P_{exp} \): expected prevalence
- \( d \): desired absolute precision [9].

A total of 384 cattle were randomly selected for the study.

2.4. Study Design:

A cross-sectional study was conducted from November, 2018 to March, 2019 to investigate the prevalence of bovine fasciolosis on cattle in Janamora Wereda. In addition, primary data was also collected on body condition and age of the animals by physical examination of animals. Origins of the animals were obtained by asking the owners and recorded it. The diagnostic sensitivity and specificity of the sedimentation technique was determined in comparison with the post-mortem findings. Fecal samples were collected during ante-mortem examination and the animals were given identification number for the subsequent postmortem examination of liver.

2.5. Fecal Sample Collection and Examination

Fecal samples were collected directly from the rectum of the animals using sterile disposable plastic gloves. The samples was taken to Gondar University parasitology laboratory in tightly closed universal bottles and examined for Fasciola eggs using sedimentation method. Each sample was serially numbered and recorded with the animals’ age, sex, and origin and body condition. To differentiate between eggs of paramphistome spp and fasciola spp, a drop of methylene blue solution (1%) was added to the sediment. Eggs of fasciola spp showed yellowish color while egg of paramphistome spp stained by methylene blue and the granule are transparent [12].

2.6. Data Management and Analysis

The data collected during the coprological and post mortem findings were coded and entered in Ms-Excel spreadsheet for statistical analysis. The data was analyzed using SPSS version 20.0 software. The prevalence of fasciolosis was calculated by dividing the number of cattle harboring Fasciola parasites by the number of cattle examined. Pearson’s chi-square (X2) was used to measure association between prevalence of the parasite with the potential risk factors. To determine the presence of significant association a p-value ≤ 0.05 was considered at 95% confidence level.

3. RESULTS

3.1. Prevalence and Species of Fasciola Identified up on Postmortem Examination

Out the total of 384 cattle examined, 134 (34.89 %) revealed the presence of Fasciola species on post-mortem examination. The prevalence was 21.6% (N=83) upon coprological examination for fasciolosis. The highest prevalence of fasciolosis was observed in poor body condition cattle when compared to cattle with medium and good body conditions and the difference was statistically significant (P < 0.05), but statistical significant difference was not observed (P>0.05) among origins and age groups of the animals as shown in Table 1.
Table 1: Prevalence of bovine fasciolosis based on body condition, age and origin

<table>
<thead>
<tr>
<th>Category</th>
<th>Variable</th>
<th>No examined</th>
<th>Positive</th>
<th>Prevalence (%)</th>
<th>X2</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCS</td>
<td>Poor</td>
<td>44</td>
<td>29</td>
<td>65.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>222</td>
<td>72</td>
<td>32.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good</td>
<td>118</td>
<td>33</td>
<td>28.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Adult</td>
<td>309</td>
<td>107</td>
<td>34.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Old</td>
<td>75</td>
<td>27</td>
<td>36.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Origin</td>
<td>Gasha Jagrie</td>
<td>148</td>
<td>53</td>
<td>35.8%</td>
<td>1.107</td>
<td>.953</td>
</tr>
<tr>
<td></td>
<td>Deresgie</td>
<td>65</td>
<td>25</td>
<td>38.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rob Gebeya</td>
<td>44</td>
<td>16</td>
<td>36.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Denkolako</td>
<td>32</td>
<td>10</td>
<td>31.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enchet Kab</td>
<td>19</td>
<td>6</td>
<td>31.6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BCS = Body condition score

Of the total 134 positive samples on post-mortem examination, Fasciola hepatica was the most common with 55.97% (N=75) occurrence followed by F. gigantica (17.91%, N=24). Mixed infection with the two species and immature flukes were also observed as indicated in table 2.

Table 2: proportion of Fasciola species found in infected liver

<table>
<thead>
<tr>
<th>Species of Fasciola</th>
<th>No of liver infected</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. hepatica</td>
<td>75</td>
<td>55.97%</td>
</tr>
<tr>
<td>F. gigantica</td>
<td>24</td>
<td>17.91%</td>
</tr>
<tr>
<td>Mixed infection</td>
<td>12</td>
<td>8.96%</td>
</tr>
<tr>
<td>Unidentified (immature)</td>
<td>23</td>
<td>17.16%</td>
</tr>
<tr>
<td>Total</td>
<td>134</td>
<td>100%</td>
</tr>
</tbody>
</table>

3.2. Comparison of Coprological and Post Mortem Examination

From the total 384 cattle examined for the presence of Fasciola, post mortem finding revealed better result (34.89%) than coprological examination (21.6%), which showed us that the sedimentation technique used for Fasciola egg assessment was failed to detect eggs from some faecal samples (Table 3).

Table 3: Comparison of coprological and post mortem examination

<table>
<thead>
<tr>
<th></th>
<th>Post mortem examination</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Coprological</td>
<td>83</td>
<td>0</td>
</tr>
<tr>
<td>examination</td>
<td>51</td>
<td>250</td>
</tr>
<tr>
<td>Total</td>
<td>134</td>
<td>250</td>
</tr>
</tbody>
</table>

Sensitivity=83/134= 61.9%
Specificity= 250/250=100%

4. DISCUSSION

The overall prevalence, about 35%, of bovine fasciolosis observed by post mortem examination in this study is in agreement with the report of Mulugeta, [13] from Asella abattoir who reported 34.97% prevalence. However, it is lower when compared to the result of other workers from different parts of the country such as Yilma and Mesfin [14] who reported a 90.7% prevalence of fasciolosis in cattle slaughtered at Gondar abattoir. Tolosa and Tigre [15] also recorded a prevalence of 46.2% at Jimma abattoir and Demissie [16] reported 54.5% prevalence of fasciolosis from the same abattoir. However, it is higher than 25.33% prevalence reported by Wondosen [17] from Wolaita Sodo municipal abattoir, 29.75%

One of the most important factors that influence the occurrence of fasciolosis in an area is availability of the suitable snail habitat. Optimal temperature to the levels of 10 °C and 16°C are necessary for snail vectors of Fasciola hepatica and Fasciola gigantica, respectively [20]. Difference in prevalence among the geographical locations therefore, is attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature from where the animals were brought to the abattoir. Management practice and suitability of the environment for survival and distribution of the parasite may have played a role in such differences.

The current study indicated that animals with good body condition had less prevalence of fasciola infection. This could be due to a better immunity in animals with good body conditions. It may also signify the importance of fasciolosis in causing weight loss, a characteristic sign of the disease [21]. Statistical analysis of infection rates on the basis of age indicated a fairly similar prevalence, about 35% in adult and 36.0% in old animals. This showed that age had no effect for the occurrence of fasciolosis. This might be due to grazing of all age groups in similar fasciola contaminated pasture land [22]. Similar results which support the present finding were reported by Mitiku [23] that indicated 30.2% in adults and 34.9% in olds, as well as Yasin [24] also reported 31.10% in adults and 37.14% in olds. In contrary to these, results indicating inverse association of prevalence rate and age of cattle were reported by Mulugeta, [25] 61.78% in adults and 20.0% in olds.

This study also revealed that there is no significant difference (P>0.05) among the different origins of the animals with respect to the prevalence of Fasciolosis. This could be attributed to similarity of the agro-ecological conditions such as altitude, rainfall and temperature favouring the development of intermediate hosts and the parasite stages as all the origins are in the near vicinity of the abattoir.

Fasciola species identification in this study revealed F. hepatica to be the most prevalent (55.97%) compared to F. gigantica (17.91%), mixed infection (8.96%), and unidentified species (17.16%). Similar findings were reported by Sisay and Nibret [26] who reported (69.5%), (14.4%), (6.9%) and (9.2%) of F. hepatica, F. gigantica, mixed and unidentified (immature) respectively. It is also in agreement with the reports of Nega [18] Aragaw [19] stated that the most common liver fluke species affecting cattle at Wolaita Soddo was Fasciola gigantica, and studies in other countries of Africa, reported F. gigantica as a predominant species encountered in bovine and ovine [7]. The prevalence of fasciolosis and the occurrence of a specific type of Fasciola species are known to vary with locality. The highest prevalence of F. hepatica in the current study might be associated with the existence of favorable ecological biotopes for the snail, Lymnaea truncatula, in Ethiopia [27]. It has been reported that there exists variation in the degree of F. hepatica occurrence in all areas of the country except in the arid north-east and east of the country. F. gigantica has been reported to occur in the western zone of the country with localized foci in the south and east. Fasciola gigantica in Ethiopia is found at altitudes below 1800 meters above sea level. While Fasciola hepatica is found at altitude of 1200- 2560 meters above sea level. Mixed infections by both species can be encountered at 1200-1800 masl [28].

The prevalence of fasciolosis found in the present study was higher by post mortem finding than the coprological examination. This finding was in line with that of Nega [18] and Wondosen [17] who reported that the post mortem prevalence was higher than that of coprological examination, this may be due to the need of longer period from 8-15 weeks after infection for the appearance of Fasciola egg in the feces [29]. Coprological examination includes numerous steps that increase the chance of losing eggs, as demonstrated by the lower number of positive result recorded in this work. Eggs may remain in the debris while filtering the feces through gauze or may get fixed on the bottom and wall of the container and within the pipette when taking the sediment for microscopic observation. Furthermore the detection of Fasciola eggs and the appearance of the disease in some areas were difficult to detect during the prepatent period because eggs are expelled intermittently depending on the evacuation of the gall bladder and life cycle of Fasciola [30].
5. CONCLUSION AND RECOMMENDATIONS

In conclusion, the present study confirmed that fasciolosis is highly prevalent on cattle in Janamora Wereda. As cattle slaughtered at the village are bought from different cattle markets in the nearby districts, it can be concluded that fasciolosis is still prevalent in cattle in Janamora and surrounding woredas. The high level of Fasciola in cattle in the present study represent high rate of infection and immense economic losses to the country. It was also observed that coprological examination for the parasite eggs has significant limitations in detecting the presence of fasciolosis in animals. Therefore, based on the current findings the following recommendations are forwarded:

a. Strategic control of liver fluke in the study area is recommended to reduce the burden of fasciolosis and the subsequent economic loss.

b. In the diagnosis of fasciolosis, epidemiological information and clinical manifestations should be considered in negative fecal sample results.

c. Animal owners should be aware of the effect of fasiolosis on livestock and proper implementation of control and prevention methods to reduce the burden.

d. Further epidemiological investigations should be initiated to assess the worm burden in Ethiopia, study the associated risk factors and economic losses.

5. REFERENCES


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