A Cross Sectional Study On The Prevalence And Possible Risk Factors Of Bovine Fasciolosis In And Around Gozamen District Northwest Ethiopia

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Abstract: A cross-sectional study was conducted from December, 2018 to April, 2019 in and around Gozamen district, Northwestern Ethiopia to estimate the prevalence of bovine fasciolosis and to identify the associated risk factors. Simple random sampling was used to select the study animals and coprological examination using sedimentation technique was applied for the recovery of fasciola eggs from freshly collected faecal samples. Out of 384 faecal samples examined, 87 (22.66%) were found positive for bovine fasciolosis. The prevalence of bovine Fasciolosis was higher in local breed cattle (26.22%) than cross breed cattle (12.24%). Similarly, the prevalence of the disease in young and adult cattle was 26.96% and 21.36%, respectively. However, there was no statistically significant difference ($p>0.05$) between the two breeds and age groups. The prevalence of bovine fasciolosis in female and male cattle was 14.85% and 31.32%, respectively. The highest prevalence of fasciola infection was observed in poor body conditioned animals (26.70%) followed by medium body conditioned animals (20.44%). Whereas, the lowest prevalence of the disease was observed in good body conditioned animals (14.29%). There was also statistically significant difference among in different body conditioned animals and between two sexes ($p<0.05$). The prevalence of the disease was highest in extensively managed animals (26.45%) in relative to semi intensive (13.95%) and intensive management system (9.09%). And also there was statistically significant difference among the three management systems ($p<0.05$). Therefore, this study indicated that bovine Fasciolosis is becoming one of the major cattle health problems in and around Gozamen district. Accordingly, farmers should be advised and educated regarding to the reduction of the disease and its intermediate host and also strategic use of de-worming and treatment, appropriate grazing management in the study area should be practiced.

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1. Introduction

Ethiopian livestock productivity, despite its huge population size, remains marginal due to various diseases, malnutrition and management constraints. Parasitism represents a major obstacle to the development of sub-sector (Malone et al., 1998). Bovine fasciolosis is one of the most important parasitic diseases of cattle causing mortality and production losses in various parts of Ethiopia. Fasciolosis is the priority disease in the highland as well as in lowland areas of Amhara region (Solomon Woldemariam and Abebe Wossene, 2007). The members of this genus are commonly known as liver flukes. They are responsible for widespread mortality and morbidity in cattle characterized by weight loss, anemia and hypoproteinemia. The two most important species include F. hepatica found in the temperate cooler areas of highland, in the tropics and subtropics and F. gigantica which predominates in tropical areas (Urquhart et al., 1996). Parasitic F. hepatica infects cattle and other mammalian species and is endemic in many parts of the world (Rapsch et al., 2006) and F. gigantica is the most common species found in Africa and Asia. It is recognized as major source of loss of production in domestic ruminants (Woman et al., 1998). In Ethiopia, the prevalence of bovine fasciolosis has shown to range from 11.5% to 87% (Malone et al., 1998). F. hepatica was shown to be the most important fluke species in Ethiopian livestock with distribution over three quarter of the nation except in the arid northeast and east of the country. The distribution of F. gigantica was mainly localized in the western humid zone of the country that encompasses approximately one fourth of the nations (Tadele Tolossa and Worku Tigre, 2006; Malone et al., 1998). The disease is found in vast water lodged and marshy grazing field condition anticipated to be ideal for the propagation and maintenance of high prevalence of fasciolosis. In Ethiopia, the highlands contain pockets of water logged marshy areas. These provide suitable habitats year round for the snail intermediate hosts (Solomon Woldemariam and Abebe Wossene, 2007). More rational prophylactic programs based on local epidemiological information are needed for sound fasciolosis control strategies in Ethiopia (Yilma Jobre and Malone, 1998). Though the problem

due to Fasciola was reported from different parts of the country, information on the current status from different locations need to be attained. This study aims to fill such gap and hence been carried out in cattle in and around Gozamen district.

Therefore, this study was carried out mainly:

- To estimate the prevalence of bovine Fasciolosis in and around Gozamen district.
- To identify the possible risk factors for the occurrence of the disease.

3. Materials And Methods

3.1 Study Area

The study was conducted from December, 2018 to April, 2019 in and around Gozamen woreda, which is one of the 19 districts in East Gojjam zone of Amhara National Regional State. It is found in the North western highlands of Ethiopia at a geographical location of 10°1′ 46″ and 10° 35′ 12″ N latitudes and 37° 23′ 45″ and 37° 55′ 52″ E longitudes and at a distance of 305 and 251 km from Addis Ababa and Bahir Dar, respectively. Debre Markos is the capital of the district and it contains 25 rural-kebeles. The district was surrounded by Aneded and Debay Tilatgin in the East, Machakel and Debre Elias in West, Sinan district in North, Baso Liben district and Abay River in the South. The district has an altitudinal difference of 1200-3510 meter above sea level. Based on these altitudinal differences, the district has three agro-climatic zones namely, Dega, Woina-dega and Kola. The average annual rainfall of the district was 1628 mm with the rainy season extended up to 6 months. However, the heavy rainfall is concentrated in the Meher season of June to September. The maximum and minimum average temperatures are 25°C and 11°C, respectively. Agriculture is the mainstay of farmers in the district which is characterized by mixed crop livestock production systems. The most important crops grown in the district are cereals like wheat, teff, maize, barley and oats. Pulse crops such as horse beans and chickpeas are produced. Oil seed crops (linseed and Niger seed), Vegetables (onion, garlic, potato, tomato, pepper and carrot) and fruits (banana, mango, papaya, orange and lemon) are also produced in the district. The district has a livestock population of 220190 cattle, sheep and goat 121147, 40131 equines, 133970 poultry and 10,996 beehives. (CSA, 2017).

3.2. Study animals

The sampling units of the study were cattle of different breed, age, sex and that were found in and around Gozamen woreda. The study animals were randomly sampled from the study area. The breed of cattle was categorized as local and cross (local v_s Holstein Friesian) breeds. This study included both sex of cattle and their age groups, which were categorized as young and adult (Annex: 1). The cattle had different body condition scores like, good, medium and poor body condition score (Annex: 2) and they were kept in three different management systems (extensive, semi intensive and intensive management systems).

3.3. Study design

A cross-sectional study was conducted to determine the prevalence of bovine fasciolosis and its possible risk factors in and around Gozamen district by laboratory examination employing sedimentation technique on feces collected directly from the rectum of live animals (cattle).

3.4. Examination Method

This study was performed by coprological examination of samples which were collected from randomly selected animals. First the history of the animals was taken from their owners about previous treatment, management system, and feeding practice and then Samples of fresh faeces were collected directly from the rectum of the cattle. Then the collected samples were preserved by 10% formalin in a universal bottle with proper labeling of every necessary information and then transported to Gozamen woreda animal health diagnostic laboratory room. Then, the samples were examined by using sedimentation technique (Annex: 3).

3.5. Sample Size Determination and Sampling Method

The sample size of the study was calculated according to Thrusfield (2005). To determine the sample size, the expected prevalence of 50% was considered by 95% confidence interval at an absolute precision of 5%. Accordingly, the required sample size was calculated to be 384.

By using the following formula,

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

Where: n= required sample size
p_{exp}= expected prevalence
d= desired absolute precision

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

$n=(1.96)^2*50\%*(1-50\%)/5\%^2$
$n=3.8416*0.5*(1-0.5)/0.0025$
$n=0.9604/0.0025$
$n=384$

Therefore, the number of cattle, examined in this study was calculated to be 384.

Simple random sampling method was applied to select study animals. During sampling of the animals,

their breed, age groups, sex, body condition score were recorded.

On this study 384 samples were collected randomly from cattle of different breed (local and cross) of animals, from both sexes of animals that were grouped under different age groups, from different body conditioned animals that were kept under different management systems.

3.6. Data Analysis

The data was entered into Microsoft excel Data base and analyzed using SPSS statistical soft ware programs version-16. The overall prevalence of the disease was calculated as dividing the number of positive animals by the total number of examined animals, which is expressed in percent. Pearson's chi-square ($\chi 2$) was used to evaluate the association between the prevalence of the disease with various possible risk factors. In this analysis p-value less than 0.05 at 5% level of significance were considered as statistically significant.

4. Results

The prevalence of Fasciolosis in bovine was investigated based on the presence of *fasciola egg* in the faecal samples. Out of the total 384 faecal samples examined, 87 (22.66%) samples were found to be positive for *fasciola eggs*. The prevalence of Fsasciola infection was compared between different groups of animals. When the prevalence of the disease was compared between animals of different body condition, and between sex groups and management system, there was statistically significant difference. However, there was no statistically significant difference in prevalence between local and cross breeds of cattle, among different age groups of study animals.

Table 1: Overall prevalence of bovine Fasciolosis on the study areas.

Total No. of animals examined	No. of possitive	No. of negative	Prevalence
384	87	297	22.66%

When the prevalence of Fasciola infection in the two sex groups of animals was compared, the prevalence in males (31.32 %) was higher than that of prevalence in females (14.85 %). And also, there was statistically significant difference between the prevalence of both sexes (P <0.05) (Table 2).

Table 2. Prevalence of Fasciola infection between female and male cattle

Sex	No. of examined	No. positive (%)	No. of negative (%)	χ^2	P-Value
Female	202	30 (14.85)	172 (85.15)		
Male	182	57 (31.32)	125 (68.68)	15.548	0.00
Total	384	87 (22.66%)	297 (77.34)		

The prevalence of bovine Fasciolosis was higher in local breed cattle (26.22%) than cross breed cattle (12.24%) (Table: 3). However, there was no statistically significant difference in prevalence of Fasciola infection between the two groups of breeds of cattle (p>0.05) (Table 3).

Table 2: Prevalence of Fasciola infection between local and cross breed cattle in and around Gozamen district.

Breed	No. of examined	No. positive (%)	No. of negative (%)	χ^2	P-Value
Local	286	75(26.22)	211 (73.78)		
Cross	98	12 (12.24)	86 (87.76)	2.825	0.093
Total	384	87 (22.66%)	297 (77.34)		

The highest prevalence of Fasciola infection was observed in young cattle (26.96%) and the lowest prevalence was observed in adult cattle (21.36%). However, there was no statistically significant difference in both age groups of cattle (P> 0.05) (Table 4).

Table 4: Prevalence of Fasciola infection between two age groups of cattle in the study area

Age	Total examined animal	No. of positive (%)	No. of negative (%)	χ^2	*P*-value
Young	89	24 (26.96)	65 (73.03)		
Adult	295	63 (21.36)	232 (78.64)	0.804	0.370
Total	384	87 (22.66)	297 (77.34)		

The prevalence in poor body conditioned animals (26.7%) was the highest followed by that of medium body conditioned animals while the lowest was in that of good body conditioned animals and the prevalence

was statistically significant ($p<0.05$) among animals of different body conditions (table 5).

Table 5: Prevalence of fasciola infection among animals of different body conditions.

Body condition	Total animal examined	No. of positive (%)	No. of negative (%)	χ^2	P-value
Poor	191	51 (26.70)	140(73.30)		
Medium	137	28 (20.44)	109(79.56)	6.712	0.035
Good	56	8 (14.29)	48(85.71)		
Total	**384**	87 (22.66%)	297 (77.34)		

When prevalence of Fsaciola infection was compared in animals of different management system, the highest prevalence was observed in cattle kept under extensive management system (26.45%) than semi intensive management system (13.95%), while the lowest was observed in animals kept under intensive management system (9.09% (Table 6). There was statistically significant difference in prevalence among animals in different management system ($p<0.05$).

Table 6: Prevalence of Fasciola infection among cattle kept under different management system.

Management system	Total animal examined	No. of positive (%)	No. of negative (%)	χ^2	P-value
Extensive	276	73(26.45)	203(73.55)		
Semi intensive	86	12(13.95)	74(86.05)	8.777	0.012
Intensive	22	2(9.09)	20(90.91)		
Total	**384**	87 (22.66%)	297 (77.34)		

5. Discussion

In this study, the prevalence of Fasciola infection was examined based on the presence of fasciola eggs in the faecal samples. This result was an indication for the presence of bovine fasciolosis in the study area. The overall prevalence of bovine fasciolosis in the present study area was 22.66%. This result was agree with the findings of Yeneneh (2011), Melkie and Tewodros (2015) and Rehman et al., (2013) who reported prevalence of 23.96% and 25.75% in Northwest, respectively. The overall prevalence of fasciolosis in the current study area was higher than the previous studies done by Fufa et al., (2009), Mulat et al., (2012) and Terefe et al., (2012) who reported the prevalence of 4.9%, 12.4% and 8.94% in Soddo and Kombolcha, Kombolcha, Gondar and Jimma, respectively. The differences in the prevalence between the current study and other mentioned studies might be related to the variation in the agro-climatic condition, animal health interventions and management system in the different study areas. It might also be depend on the season of the year in which the study was conducted. High prevalence of bovine fasciolosis had been reported by other researchers such as Dagne (1994) in and around DebreBerhan (80%), Fekadu (1988) around Bahir Dar (60.2%), Wondwossen (1990) in Arsi Administration region (53.72%), Tsegaye et al., (2013) in and around Woreta (41.14%), Woldemariam and Wossene (2007) in Mecha and Fogera (37.2%), (33.42%) by Yilma and Malone (2000) in Gondar and Aregay et al., (2013) in and around bahir dar (36.72%). In this study the prevalence of bovine fasciolosis was relatively low. This might be due to the expansion of animals' health post at peasant association level and gradually the farmers might be awared related to treatment and strategic de-worming of their cattle as well as practicing good management system. The prevalence of fasciolosis with regard to age was not statistically significant ($P>0.05$). This result was supported by Tsegaye et al., (2013), Melkie and Tewodros (2015) and Yeneneh (2011). This might indicate that age of the animals had no impact in the infection rate if both age groups were allowed to graze and exposed to the infection. However, this finding disagreed with the works of Woldemariam and Wossene (2007), Yilma and Malone (2000), in which their results showed that the detections of Fasciola eggs were lower in young than adults. This might be attributed to the fact that calves were not driven with older age groups to grazing and waterin points. They were kept at a nearby village where the source of feeding was much limited. This practice naturally reduced the chance of exposure in this age class FAO, (1999). Moreover, inverse co-relation of prevalence and age of cattle were also reported by Dagne (1994), Melkie and Tewodros (2015), Rahmato (1992) and Fekadu (1988). In the present study, the prevalence of bovine fasciolosis with regard to sex was statistically significant where higher prevalence was recorded in male (31.32%) than female animals (14.85%). This indicated that sex had impact on the infection rate and males were more susceptible and exposed to the disease than females. This was probably related to the management system with longer exposure of male outdoor while females were kept in door during pregnancy and lactation.

Similar results were reported by Block and Arthur (1985) and Melkie and Tewodros (2015) Opara (2005). However, this result disagreed with the works done in different countries such as Keyyu *e tal*,. (2005), Pfukenyi *e tal*,. (2006) and Fatima *e tal,*. (2008), in which female cattle exhibited a significantly higher prevalence rates than males. On the other hand, the works done by Rahmato (1992), Dagne (1994), Woldemariam and Wossene (2007), Tsegaye et al., (2012) Chakiso et al,. (2014) and Aregay e tal., (2013) concluded that sex had no impact on the infection rate and hence both male and female were equally susceptible and exposed to this disease. In the present study, there was no significant difference (P>0.05) observed in bovine fasciolosis between local and cross breed cattle. This indicated that there was no difference in acquiring Fasciola infection between the two breeds which were equally susceptible and exposed to the disease. This could be due to the absence of differences in the management practices of the farmers. Similar result was worked by Yeneneh (2011) and Yildirim *e tal*,. (2007). In contrary to this result, the works of Tsegaye et al., (2012) and Mousa *et al,*. (2013), stated that local breeds were more affected than cross breeds. This could be due to differences in the management practices of the owners where the local breeds were reared under traditional husbandry system which enforced them to be exposed for different infection sites and owners gave more management attention to cross-breed than local breeds because of their production differences. The results of the present study indicated that a statistically significant (P<0.05) higher infection rate of fasciolosis was recorded in cattle with poor body condition (26.70%) than medium (20.44 %) and good body (14.29%) condition animals. This study agreed with the resut of Terefe ea., (2012) and Hagos (2007). It is the fact that, the disease defence mechanism of the animals with poor body condition is very low. And also might be traditionally, the farmer harvest green foodder from the marsh areas where the snails were found and fed their animals in order to compensate their body condition score. This finding disagreed with the report of Melkie and Tewodros (2015), where the prevalence was higher in those animals with medium body condition than in those with poor and good body conditions. On the other hand, reports by Aregay et al., (2013) and Woldemariam and Wossen (2007) indicated that there was no statistically significant difference (P>0.05) among the different body condition scores. This could be attributed to the similarity of agro-ecological conditions favoring the development of intermediate hosts and livestock management system. The prevalence of bovine Fasciolosis was highest in animals that were kept under extensive management system (26.45%) followed by in animals from semi-intensive management system (13.95%) and the lowest prevalence was observed in animals that were kept under intensive management system (9.09%). And also the difference was statistically significant (P<0.05). It is the fact that, animals belonging to the extensive management system are more exposed to Fasciolosis than those animals kept in door. Relatively, the prevalence of bovine Fasciolosis was lower in intensive management system than semi intensive management system. The reason may be related to; in case of intensive management system animals were managed indoor. So the risk of exposure for the disease is low. However, they may be exposed for the disease in the condition of contamination of feeding and watering troughs as well as in supplementation of green foodders which is harvested from marsh areas containing cercarial stage of the parasite.

6. Conclusion And Recommendations

The prevalence of bovine Fasciolosis recorded in this study based on coprological examination revealed that bovine Fasciolosis is one of the endemic diseases in the study area that deserve serious attention in the future. The disease can cause significant economic loses throughout the world. The disease was detected in breeds of cattle, sexes, age groups, body condition score, management systems. In addition, occurrence of the disease is closely linked to the presence of bio-types suitable for the development and multiplication of intermediate hosts. Therefore, this study revealed that bovine Fasciolosis was one of the major parasitic diseases contributing to loss in productivity and production of cattle in the study area. Based on the present study the following recommendations are forwarded as related to the existing reality of the study area.

- Fasciola infection should be taken into consideration as one of the limiting factor for livestock productivity in and around gozamen woreda.
- Direct killing of intermediate host; snails with chemicals or destroying their habitats through drainage system should be implemented.
- Awareness should be created for the owners of the animals about the risk factors of the disease and its transmission, as much as possible do not allow to graze their cattle freely on swampy or marsh areas and also supply dry feeds and clean water for their cattle regularly.
- Strategic treatment and deworming interventions should be applied to prevent losses incurred by Fasciolosis and also further detailed studies are needed to gather enough information about the parasite itself and its intermediate host, which is used to control fasciola infection in the area.

- Researches should be encouraged towards the development of vaccines for Fasciola infection which is considered as control measurement of the disease.

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