

Full Length Research Paper

Prevalence of bovine fasciolosis in and around Bahir Dar, North West Ethiopia

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A cross sectional study was conducted from November, 2013 to April, 2014 to determine the prevalence and associated risk factors of bovine fasciolosis in and around Bahir Dar. A total of 384 fecal samples were examined by sedimentation and 124 (32.3%) were found positive for bovine fasciolosis. Risk factors such as site, sex, age, body condition score and breed were taken into consideration. Prevalence differed significantly between study sites ($P < 0.05$): 54% in Sebatamit, 41.2% in Addisalem, 19.2% in Zenzelma and 16%, in Yibab. Similarly, 48.4 and 30.9% prevalence were recorded for cross and local cattle breeds respectively. There was statistical significance difference between prevalences recorded in cross (48.4%) and local breeds (30.9%; $P < 0.05$). Prevalence based on sex showed 35.7% in male and 29.2% in female individuals, in age 29.2% young and 33.6% adult, and in body condition score 29.9% good, 31.2%, medium and 34.2% were recorded. There was higher prevalence in male than female, adult than young and poor body condition than good and medium body condition score. However, no statistical significance ($P > 0.05$) was observed for these three variables (sex, age and body condition score). This study showed that fasciolosis is prevalent in the study area, and this signifies the need for intervention through awareness creation on the preventive strategies among farmers and veterinarians.

Key words: Bahir Dar, bovine, fasciola, prevalence.

INTRODUCTION

Agriculture is the main source of Ethiopian economy. More than 38 million cattle and 39 million small ruminants, 8.6 million equine, 1 million camels, and 55.4 million chickens, consists major portion of livestock resource in Ethiopia (Zelalem and Fletcher, 1993; Asfaw, 1997; Ayele et al., 2003). The diverse ecology in Ethiopia makes Ethiopia home to a large population of different domestic and wild animals with considerable contribution to the national economy (Desalegn and Yermineh, 2004). Ethiopia's livestock productivity,

despite its huge livestock population size, remains marginal due to prevalent diseases, malnutrition, and management problems. Parasitism represents a major problem/obstacle to the development of this sub-sector (Malone and Yilma, 1998). Bovine fasciolosis is an economically important parasitic disease of cattle. The economic losses due to fasciolosis throughout the world (including Ethiopia) are enormous and these losses are associated with mortality, morbidity, reduced growth rate, condemnation of fluky liver, and increased susceptibility

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to secondary infections and expense of control measures and treatment (Bowman et al., 2003).

Fasciolosis is the diseases of ruminants with zoonotic potential. Humans are infected by eating aquatic plants containing encysted metacercariae or drinking contaminated water (Andrew, 1999; Mark and Dalton, 2009; Smith and Sherman, 2009). The two species most commonly implicated as the etiological agent of fasciolosis are *Fasciola hepatica* and *Fasciola gigantica*. *F. hepatica* has a worldwide distribution but is predominant in temperate zones, while *F. gigantica* is also found in most continents primarily in tropical (Andrew, 1999). The definitive hosts for *Fasciola* species are mammals, particularly cattle and sheep. The geographic distribution of parasitic trematode species is dependent on the distribution of suitable species of snails which act as intermediate hosts. The genus *Lymnaea* in general and *Lymnaea truncatula* in particular, are the most common intermediate hosts for *F. hepatica*. This species of snail was reported to have a worldwide distribution. The intermediate host for *F. gigantica* in Africa is *Lymnaea natalensis* (Urquhart et al., 1996).

The presence of fasciolosis due to *F. hepatica* and *F. gigantica* in Ethiopia has long been known, and its prevalence and economic significance has been reported by several studies (Wondwosen, 1990; Mulugeta et al., 1993; Mezgebu, 1995). The prevalence of bovine fasciolosis has shown to range from 11.5 to 87% (Malone and Yilma, 1998). Fasciolosis is the priority diseases in the highland and low land areas of Amhara region (Solomon and Abebe, 2007). *F. hepatica* was shown to be the most important fluke species in Ethiopian livestock with a geographic distribution ranging over three quarter of the nation except in the arid northeast and east of the country. The spatial distribution of *F. gigantica* was mainly localized in the western humid zone of the country that encompasses approximately one fourth of the country (Malone and Yilma, 1998). The disease is found in vast water lodged and marshy grazing field condition. These provide suitable habitats year round for the snail intermediate hosts (Solomon and Abebe, 2007). Even if there were some study and reports about bovine fasciolosis in and around Bahir Dar; there was no any documents (study) about bovine fasciolosis in Sebatamit Addisalem, Yibab and Zenzelma sites specifically (sites of present study). Therefore, the objectives of this work is to determine the prevalence of bovine Fasciolosis in the study area (selected sites) in and around Bahir Dar and to assess the epidemiological risk factors that might contribute for fasciolosis, and to generate valuable base line information for further studies that will be conducted in the area

MATERIALS AND METHODS

Study area

A cross sectional study was conducted from November, 2013 to

April, 2014 in and around Bahir Dar. Bahir Dar is the capital city of Amhara regional state, which is found 565 km away from Addis Abeba, northwest of Ethiopia. The altitude of the area is 1500 to 2600 m.a.s.l. Bahir Dar is located between 12° 29'N latitude and 37°29'E longitude with an average annual rain fall ranging from 1200 to 1600 mm, annual temperature ranging from 8 to 31°C. About 70% of the land is featured by plain plateaus and covered by various bush formation, low woods mainly ever green lands some semi-humid highland vegetation planted with major agricultural products like teff, wheat, maize and pulse crops (CSA, 2009). Bahir Dar Zuria Woreda has a livestock population of 152,772 animals (121,470 cattle, 14,322 sheep, 9,141 goats and 7,839 equines 36,666 poultry). The biggest lake and river in Ethiopia, Tana and Blue Nile (Abay) are found in this area. The sites were selected by using simple random sampling around Bahir Dar.

Study animals

The study animals were cattle that were found in the selected sites in and around Bahir Dar (Addisalem, Sebatamit, Zenzelma and Yibab kebeles). The cattle include both local and cross between local and Holstein fresian breeds. A total of 384 cattle of all age groups and both sexes are randomly selected in the fields in different origins. The average cattle age determine by dentition as young and adult (Cringoli et al., 2002), and body condition score was recorded (Nicholson and Butterworth, 1986).

Study design and period

A cross-sectional study design was used to determine the prevalence of bovine fasciolosis, and its associated risk factors in and around Bahir Dar town from November, 2013 up to April, 2014. Breed sites (origin), age, sex and body conditions were considered as the risk factors for the occurrence of fasciolosis.

Sample size determination

The desired sample size for the study was calculated using the formula giving by Thrusfield (2005) with 95% confidence interval, 5% absolute precision and 50% expected prevalence as showed below:

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

Where

n = the required sample size,
P exp = expected prevalence,
D = absolute precision.

Therefore, based on the formula the total sample size calculated were 384. From the total of 384 sample, size 100, 85,100 and 99 cattle were selected at Sebatamit Addisalem Yibab and Zenzelma, respectively.

Sampling methodology and laboratory technique

Fecal (Coprological) examination

Fecal samples were recorded to data recording format. The age of the animals was recorded by interviewing owners and cross-checked using dental formula (Cringoli et al., 2002). The study sites were randomly selected. During sample collection: sex, body

Table 1. Prevalence of Bovine fasciolosis based on fecal examination.

Number of animal examined	Total number of positive prevalence	Percentage (%)
384	124	32.3

condition and breed, were also recorded. Coprological examination was conducted on fecal samples collected directly from the rectum of the animals into a universal bottle containing 10% formalin and transported to Bahir Dar Regional Veterinary Laboratory for examination. Sedimentation technique was used to detect the presence or absence of fluke eggs in the fecal sample collected, as described by Antonia et al. (2002). To differentiate between eggs of *Paramphistomum* species and *Fasciola* species, a drop of methylene blue solution was added to the sediment where eggs of *Fasciola* species show yellowish colouration while the eggs of *Paramphistomum* species stain by methylene blue (Hanson and Perry, 1994). The equipments and tools used for the study were beaker, strainer, measuring cylinder, mortar and pestle, test tube, test tube rack, microscope slide, cover slip and microscope. The procedure for the examination of fasciola egg is as follows: About 3 g of faeces is collected from the rectum of each selected cattle using sample bottle. The faecal sample should be crushed with mortar and pestle, and 40 to 50 ml of tap water should be added and mixed with stick and thereafter, the faecal suspension is then filtered through a tea strainer into a beaker, the filtered material should be pour into a test tube. After pouring into a test tube wait for 5 min and the supernatant fluid will discarded carefully using a pipette, transferred a small amount of the top of the layer of the sediment to a microscope slide and covered with cover slip, then examined under 40xs magnification power (Hendrix and Sirois, 2007).

Data analysis

All raw data generated from this study were entered into Microsoft office excel data base system. The findings were analyzed using statistical package for the social sciences (SPSS) version-17.0 computer program; and data were analyzed using Chi-square (χ^2) to determine the variation in infection, prevalence between sex, breeds, study sites, body condition and age groups. The total prevalence was calculated by dividing the number of disease positive animals by the total number of animals examined (Table 1). Statistical significance was set at $P < 0.05$ to determine whether there are significant differences between the parameters measured between the groups.

RESULTS

Prevalence of bovine fasciolosis

Of the total 384 fecal samples examined under microscope by sedimentation technique, 124 animals were infected by fasciolosis and an overall prevalence of 32.3% was recorded for fasciolosis in the study area (Table 1).

Prevalence of fasciolosis on study site basis

The prevalence of fasciolosis varied significantly among

the four areas (origins), and the highest prevalence of fasciolosis was observed in Sebatamit (54%), followed by Adissalem (41.2%), Zenzelma (19.2%) and Yibab 16 (16%) indicated in Table 2. Statistical analysis revealed that there was significant difference ($P < 0.05$) in infections between areas.

Sex differences in the prevalence of fasciolosis

Prevalence of fasciolosis was 35.7% from a total of 185, and 29.1% from a total of 199 in male and female animals respectively. No significant difference observed between sexes ($P > 0.05$) (Table 3).

Breed differences in the prevalence of fasciolosis

There was statically significance difference between the prevalence of bovine fasciolosis with different breed of animals ($p < 0.05$). Out of 353 local animals, the prevalence was 30.9% (109) which came from 31 cross animals. The recorded prevalence was 48.4% (15) (Table 4).

Age differences in the prevalence of fasciolosis

Prevalence of fasciolosis in bovine adult was higher than of the young. Out of 271 adults, the prevalence was 33.6% and out of 113 young the prevalence was 29.2%. There was no statically significance difference between prevalence of bovine fasciolosis within different ages of animals ($p > 0.05$) (Table 5).

Prevalence of fasciolosis and body condition score

Among the 384 animals, 161 were determined to be of poor Budd-Chiari syndrome (BCS), 197 medium BCS and 26 good BCS. The prevalence in these three groups was 62 (34.2%), 54 (31.5%) and 8(29.6%) respectively (Table 6).

DISCUSSION

Fasciolosis represents one of the most common liver parasites in domestic ruminants and humans, and is present throughout the world where the climatic conditions are suitable for snails (*Lymnaea* spp.), the

Table 2. Prevalence of bovine fasciolosis on sites/locality basis.

Site	No of animal examined	Positive	Prevalence (%)	χ^2	P-value
Sebatamit	100	54	54	44.532	0.000
Adissalem	85	35	41.2		
Yibab	100	16	16		
Elma	99	19	19.2		
Total	384	124	32.3	-	-

Table 3. Prevalence of bovine fasciolosis as compared with sex.

Sex	No of samples examined	Positive	Prevalence (%)	χ^2	P-value
Male	185	66	35.7	1.870	0.172
Female	199	58	29.1		
Total	384	124	32.3	-	-

Table 4. Prevalence of fasciolosis in cattle based on breed.

Breed	Sample size	Positive	Prevalence (%)	χ^2	p-value
Local	353	113	30.9	48.4	3.996
Cross	31	15	0.046		
Total	384	128	32.3	-	-

Table 5. Prevalence of bovine fasciolosis on age basis.

Age	No of examined animal	Positive	Prevalence (%)	χ	p-value
Young	113	33	29.2	0.698	0.403
Adult	271	91	33.6		
Total	384	124	32.3	-	-

Table 6. Prevalence of bovine fasciolosis on body condition basis.

Body condition	No of animal examined	Positive	Prevalence (%)	χ^2	p-value
Good	27	8	29.6	0.462	0.794
Medium	199	62	31.2		
Poor	158	54	34.2		
Total	384	124	32.3	-	-

intermediate hosts of *F. gigantica* and *F. hepatica* (Urquhart et al., 1996). The infection is considered a neglected disease according to the World Health Organization (WHO, 2012) and where animal cases are reported, human cases generally also exist. In general, fasciolosis was found prevalent in the study areas. This

will be a hindrance to the livestock production by causing remarkable direct or indirect losses in the study areas. The present study was designed to determine prevalence and assess risk factors associated with bovine fasciolosis by coprological examination. Based on coproscopical investigation, an overall prevalence of 32.3% bovine

fasciolosis was revealed, it is higher than the prevalence (21.22%) reported by Ayalew (2011) in and around Bahir Dar, and the prevalence of (24%) at Andassa Livestock Research Center (Asressa, 2011), and current prevalence was nearly similar to that of the prevalence (36.7%) studied by Fikremariam et al. (2009) in Bahir Dar but it was less than that of the findings at Woreta with prevalence of 41.41% by Biniam et al, 2012. This difference may be attributed to various factors such as the distribution of the study period and other factors such as availability of suitable snail habitat (Urquhart et al., 1996). This may also be associated with the sedimentation technique as the aggregated distribution of eggs in faeces makes it easy to miss eggs by taking just 3 g; eggs can be lost during sedimentation.

The prevalence of bovine fasciolosis was different in different districts (location). The higher prevalence of bovine fasciolosis was recorded at Sebatamite that is, 54%, this difference might be due to the difference in geographical location favorable to maintain the intermediate host and the disease. The prevalence of the disease in the four different sites of the study areas were 54, 41.2, 16 and 19.2% in Sebatamit, Addisalem, Yibab and Zenzelma respectively. This showed statistical difference in the prevalence of the disease between these sites ($P < 0.05$). However, higher prevalence in Sebatamit followed by Adissalesmm, due to its near location to the Abay River basin and Lack Tana which is permanently wet and water logged maintaining cyclic lifecycle of the parasites intermediates host, but the rest two origins were dry areas. The samples were taken at the same season of the year. In sex, the prevalence of the bovine fasciolosis in male and female animals was recorded as 35.7 and 29.1% (Table 3), respectively. Even if there were difference in prevalence, there was no significant difference ($P > 0.05$) between the two groups. Sex had no effect on the prevalence of the disease, because the grazing pasture land or management system was same and equally exposure to a similar contaminated pasture by both sex groups and traditionally animals are driven to pasture regardless of sex. Similar results that support the present finding were reported by Solomon and Abebe, 2007 and Fikirtemariam et al. (2009). This signifies that sex has no impact on the infection rate and both male and female animals were equally susceptible and exposed to the disease. Similar results that support the present finding were reported by Biniam et al. (2012).

In this study, the prevalence of fasciolosis in bovine showed higher in adult than young. Out of 271 adult, the prevalence was 33.6% and from 113 young the prevalence was 29.2%. No statically significance difference between prevalence of bovine fasciolosis within different ages of animals ($P > 0.05$).

In different parts of Ethiopia, different results indicating inverse correlation of prevalence and age of cattle were reported by Wondwossen (1990) and Rahmato (1999). As the age increased to the adult stage, the magnitude of

infection rate increased to a higher level. As the age of the animal increases, the possibility of being exposed to *Fasciola* increases and hence high prevalence of fasciolosis may be observed. In general, the younger the age the lower the prevalence and the older the age the higher the prevalence and this could be due the maternal immunity acquired by young animals through colostrums. This finding would not agree with the works of Solomon and Abebe (2007), and Yilma and Mesfin (2000) where the detections of *Fasciola* eggs were lower in the young group. This might be due to the fact that young and older (adults) age groups were grazing and watering in same area and had equal chance of being exposed to infection.

The infection rate of bovine fasciolosis on the basis of breed showed statistically significant difference ($P < 0.05$). Infection rate in cross breeds was (48.4%) higher than local-breed (30.9%), this could be due to differences, cross breeds are genetically susceptible than local breeds and they were high chance of being exposed to this diseases due to the high amount of feed as well as the farmers reared under traditional husbandry system, that is, local animals are resistance. The reason for high prevalence of fasciolosis and significantly difference ($P < 0.05$) in cross breed compared to local breed might be due to lower resistance of cross than local breed.

Body condition was a risk factor for bovine fasciolosis and prevalence was 34.2, 31.2 and 29.6% in poor, medium and good body condition score respectively. There was no significant variation among body condition scoring groups. The lower prevalence was observed in animals with good body condition (29.6%) and the higher was in animals with poor body condition (34.2%). This might be association (due to) with animals with poor body conditions were less resistance as a result of malnutrition or presence of other chronic diseases and environmental conditions that make minimum parasite loads to overcome the host immunity are made available. Similarly prevalence of other concurrent infection (parasitic or non parasites) might make the animal to have poor body condition. Their existence along with fasciolosis might have impact on body condition and body weight of the animals (Wassie, 1995).

CONCLUSION AND RECOMMENDATIONS

Bovine fasciolosis is a major problem in animal production, which causes decreases production, fertility, emaciation and disease and finally death. The result of this study indicates fasciolosis is 32.3% prevalent. The occurrence is closely associated with presence of suitable environmental conditions for the development of snails. The study area is suitable for the survival of the snail which worsened the situation for the future. The high prevalence reported in this study has clearly indicated lack of strategic control measures against the disease, and due to the risk of water lodgment from Abay rivers and Lake Tana which increased irrigated land

masses and ponds at grazing areas, and the tendency of farmers to graze their animals in these areas because of feed scarcity. In general, this study indicated that fasciolosis is an important infection to livestock development in the study area. Based on the conclusion, the following recommendations are forwarded:

1. Awareness creation on the preventive strategies such as drainage of marshy areas, clearing of aquatic vegetations and seasonal strategic deworming of animals should be practiced.
2. Draining or fencing of marshy areas, utilization of swampy areas for crop production, to protect the animals from infection during grazing.
3. Strategic application of fluckicide and avoiding animals grazing from marshy land plays considerable success for the control of fasciolosis in these study areas
4. Training need to be organized for farmers with economical significance and control methods of this disease in the study area.
5. Detail epidemiological study should be carried out on biology and ecology of the intermediate host so as to develop a substantiable planning and implementation on the control strategies of the disease.
6. Expansion of animal health care delivery in the area including drug supply, prophylactic and other disease control strategies.

Conflict of Interest

The authors declared that they have no conflicts of interest.

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