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Heydarus Abdulla Geja
Department of Veterinary Medicine, Chelenko Veterinary Clinic, Meta Woreda, Eastern Harerghe, Ethiopia

Mohammed Bedruddin Aliyi
Department of Veterinary Medicine, Kurfa Veterinary Clinic, Kurfa Chele Woreda, Eastern Harerghe, Ethiopia

Correspondence
Heydarus Abdulla Geja
Department of Veterinary Medicine, Chelenko Veterinary Clinic, Meta Woreda, Eastern Harerghe, Ethiopia

The prevalence and associated risk factors of bovine fasciolosis in and around Haromaya town

Heydarus Abdulla Geja and Mohammed Bedruddin Aliyi

Abstract
In order to determine the prevalence and related risk factors of bovine fasciolosis in and around Haromaya Town, a cross-sectional study was carried out between November 2018 and April 2019. The investigation was conducted utilizing the faecal sedimentation technique to retrieve parasite eggs. A total of 384 faecal samples were subjected to parasitological examination. The overall prevalence of fasciolosis was 47.9% (184/384) based on the parasitological examination. There was a statistically significant difference ($p< 0.05$) in the prevalence between age categories, with adults having a greater frequency (52.5%) than young animals (35.8%). Similarly, the infection prevalence within the sex groups varied statistically significantly ($p<0.05$), with female animals having a greater prevalence (59%) than male animals (31.6%). There was a significant difference ($p< 0.05$) in the infection rate across the various body condition scores, with the frequency being higher in animals with poor body condition (90%) than in those with good body condition (12.5%). But there was no statistically significant difference (p> 0.05) in the prevalence according to the provenance of the animal. This study demonstrated that the prevalence of fasciolosis in cattle was related to the availability of conditions that were conducive to parasites and intermediate host's abundance. The results of this research revealed that fascioliasis is endemic in the studied area. Seasonally appropriate deworming procedures are recommended for control of fascioliasis.

Keywords: Bovine, fasciolosis, Haromaya, prevalence, risk factor

Introduction

Livestock is crucial to Ethiopia's economic growth and efforts to combat poverty. Ethiopia is home to the greatest number of animals in Africa, with 42 million poultry, 2.5 million camels, 5.8 million equine species, 33 million sheep, 30 million goats, and 52 million cattle, according to the most recent CSA animal population census (2009) [11]. The majority of people rely on livestock for their daily needs since they provide draft power, money for farming communities, a method of investment, and a significant of the foreign exchange source for the country. Additionally, animals provide as a source of meat, dairy product and eggs, as well as a vital cultural resource, a social safety net, a way to save money, and a source of revenue. They also supply crops for production and transportation (DACA, 2006) [13]. Yet, the cattle subsector's economic contribution falls short of its potential and is still unrealized. The obstacle to Ethiopia's livestock development is intimidating. It is obvious that Ethiopia has the ability to increase the livestock subsector's production. However, a number of limitations must be resolved in order to increase productivity. The provision of superior assistance services, like extension services, technology advancement and distribution, strategies to improve animal nutrition and health, breeding and marketing, as well as the gathering and evaluation of baseline data for development planning, are among the areas that require focus (Juyal and Single, 2011) [37].

One of the biggest obstacles to Ethiopian livestock development is the prevalence of cattle illnesses. The susceptibility of livestock production and commerce to disease outbreaks is sabotaging investment in a potentially lucrative sector of the economy that would boost rural employment, incomes, and help reduce poverty (Shitaye *et al.*, 2007) [71].

The most common parasitic infestation that affects livestock production both directly and indirectly is fasciolosis, which is caused by digenean Trematode of the genus Fasciola, also known as liver flukes. In Ethiopia, the two most frequently implicated species as etiological agents of fasciolosis are *F. hepatica and F. gigantica*. Cattle and Sheep are the natural host for Fasciola infestation (Ahmed *et al*., 2007) [3]. *In* Ethiopia, *F. gigantica and F. hepatica* coexist; regions between 1200 and 1800 meters above sea level are known to have mixed infections with both species (Graber, 1978) [30].

The transmission of F. hepatica and F. gargantuan is attributed to the Lymnaedae family of snails, and the infestation is typically linked to grazing on damp soil and consuming water from infested watering spots (Dechasa *et al.*, 2012) [17].

Liver fluke, also known as fasciolosis, is endemic worldwide. Animal health and the economic burden of fasciolosis can vary significantly from year to year depending on a number of factors, including the host immune system, age of the animal, the level of infection, management, and climate. Many clinical outbreaks occur often in the endemic areas. There are three types of fasciolosis that present clinically in infected animals: acute, subacute, and chronic (Dawit, 2011) [16].

In tropical and subtropical nations, bovine fasciolosis causes significant economic losses for the cattle industry mostly because of death, morbidity, decreased growth rate, liver infection from a fluke, increased susceptibility to secondary infections, and the cost of control measures. Bovine fasciolosis is estimated to cause production losses in the livestock business worth more than USD 90 million per year (Sandra and Maria, 2003; Rahmeto *et al*., 2010) [66, 62].

In Ethiopia, the risk of contracting Fasciola hepatica and F. gigantica are high in regions with prolonged high annual rainfall that are also related high soil moisture and excess water. The risk decreases in regions with shorter wet seasons and/or lower temperatures. The highlands of Ethiopia and Kenya were found to be unfavorable for *Fasciola gigantica*, because an inadequate temperature regime. It was discovered that regions in Ethiopia that are below the 1200 m elevation limit of *Fasciola hepatica* had average monthly mean temperatures of 23 oC or higher (Malone *et al.*, 1998) [41].

The disease causes significant financial losses for the cattle sector, mostly due to death, liver condemnation, decreased beef output, milk, wool and anthelmintic costs (Dargie, 1987) [15]. thought to be one of the primary obstacles to cattle output, resulting in significant losses both directly and indirectly for the nation; According to published studies that are currently available, bovine fasciolosis results in annual financial losses due to only decreased productivity (Gemechu and Mamo, 1979) [28]. Many surveys were conducted in slaughterhouses across Ethiopia have revealed the existence of fasciolosis in ruminants, which is caused by two species of *F. hepatica* and *F. gigantica*. According to Nuraddis *et al*., (2010) [55] and Kassaye *et al*., (2012) [38], there are several studies that attempted to show the monetary losses resulting from the condemnation of liver and the variations in the assessment of the financial losses resulting from fasciolosis.

In addition to its significance for the global veterinary industry and economy, fasciolosis has lately been demonstrated to be a zoonosis that is spreading widely and impacting a large number of people (Esteban *et al*., 2003) [23]. The parasite condition known as fasciolosis affects both humans and animals (Bowman, 2010) [10]. Most occurrences of naturally occurring infections in people have been found in locations where animal fasciolosis is endemic, in rural communities where people and their animals share a water source, or in areas where people ingest raw veggies grown throughout endemic areas (Robinson and Dalton, 2009) [64].

There is little information available about the incidence of fasciolosis in and around Haromaya Town, despite the previously described current circumstances and the existence of several issues brought on by the disease. Therefore, this study was designed with the aims to determine the prevalence of bovine fasciolosis and major risk factors associated with the disease in and around Haromaya Town.

Materials and Methods

Study area

The study was conducted from November 2018 to April 2019 in and around Haromaya town, Eastern Ethiopia. Haramaya is located at 510 km to the Eastern of Addis Ababa, Capital of Oromia regional state. The altitude range of Haromaya is 2047 meters above sea level and its longitude and latitude are 42° 01.'' E and latitude of 9° 24'' N respectively. Haromaya town experiences an average rainfall of 870 mm, with a range of 560 to 1260 mm. The average temperature is 8.25 °C at the minimum and 23.4 °C at the maximum (HADB). The livestock population estimated to76336 cattle, 65083 sheep, 84916 goats, 22355 donkey and 89800 chickens (CSA, 2012) [12].

Study population

The study population recruited for this study was cattle having different sex, breed, age and body conditions kept under both semi-intensive and extensive management system living in and around haramaya town. The age of the animals was determined from birth records and dentition characteristics and categorized as young < 3 years and >4 years as the adult (De Lahunta and Habel, 1986) [18-19] Scoring of body condition was conducted based on the criteria described by (Mari Heinonen, 1989) [98] and categorized as poor, medium and good.

Study Design and Sample Size Determination

A cross-sectional study design was conducted from November 2018 to April 2019 to establish the prevalence and associated risk factors of bovine fasciolosis in and around Haromaya town. Active data was generated using the simple random sampling method, selected cattle was recorded with required parameters. The sample size was determined according Thrusfield, (2005) [82-83] by considering 50% prevalence, 95% confidence level and 5% precision. Accordingly, to establish the prevalence 384 animals were sampled.

$$n=\frac{1.96^2 x\ pexp\ (1-pexp}{d^2}$$

Where:

n = required sample size

P_{exp}= Expected prevalence

d = desire absolute precision

Study Methodology

Fecal sample collection and processing was done according to the procedures described by MAAF (1988) [40]. Fecal samples were collected directly from rectum of randomly selected cattle by hands protected by rubber gloves. From sampled cattle, a new fecal sample weighing roughly 10gm was taken. Each collected sample was placed into a universal bottle containing 10% formalin. The bottle labeled with the necessary parameters (The date of sampling, sex, breed, age. body condition and origin of animal). The samples were taken and brought to the parasitology lab at the Faculty of Veterinary Medicine, Haramaya University. Sedimentation technique was used in the laboratory to undertake coproscopic tests (Hansen and Perry, 1994) [32]. A total of 384 cattle fecal samples were gathered during the study period.

Data management and analysis
The collected data were entered and analyzed using SPSS version 20 computer software. The percentage of affected cattle among the total number of cattle examined was used to compute the prevalence of fasciolosis. Pearson's Chi-square (χ2) test was used to evaluate categorical data in order to establish a statistical relationship between the parasite prevalence and possible risk factors. Significant differences between the measured parameters were defined as $p< 0.05$ for all analyses.

Results
From the total 384 fecal sample examined for fasciolosis, 184 (47.9%) were found to be positive for *Fasciola* eggs. Based on the origin of the animal, the prevalence rate was highest in Tuji gabisa 52.1% (49) and lowest in Ifa bate 41.9% (18), with a statistical significant difference (p> 0.05).

Table 1: The prevalence of bovine fasciolosis in different PAs around Haramaya Town

Origin of the animals	No. examined	No. positive	Prevalence (%)
Adele	91	42	46.2
Haromaya town	86	40	46.5
Tujigebisa	94	49	52.1
Ifa oromia	70	35	50
Ifa bate	43	18	41.9
Total	384	184	47.9

Pearson chi-square=1.603, pr=0.808 (p>0.05)

Table 2: Bovine fasciolosis prevalence by breed, sex, and BCs.

Sex	No. Examined	No. Positive	Prevalence (%)	X^2	p-value
Male	155	49	31.6	27.683	0.001
Female	229	135	59		
Adult	278	146	52.5	8.445	0.001
Young	106	38	35.8		
Good	72	9	12.5	110.808	0.001
Medium	216	88	40.7		
Poor	96	87	90		
Local	306	184	45.8	2.829	0.025
HF*	78		56.4		
Total	384		47.9		

Discussion
In the present study, the prevalence rate determined by coprological investigation was 47.9%. This conclusion was lower than that of Gemechu *et al.*, (2008) [29], who reported the frequency of occurrence of 53.9% at Haromaya town. This finding was greater than 42.9% found by Hymanot (1990) [35] in the Eastern Hararghe Administrative Region. The present prevalence in and around Haromaya town closely similar to Shiferaw *et al*., (2010) [69] with a prevalence of 45.25% in and around Assela town. This finding and the 45.25% found by Ayalew and Endalkachew, (2013) [6] at the Bahir-Dar Municipal Abattoir in Northern Ethiopia were very similar. But this finding was higher than the findings of Tsegaye *et al.*, (2012) [86], 41.41%, in and around Woreta, North Western Ethiopia. The present result was lower than Yadeta, (1994) [93] in Western Showa (82.5%), Bahru and Ephraim, (1979) [7] in kaffa (86%), Dagne, (1994) [14] in and around Debre-Berhan (80%), Ahmadi and Meshkehkar, (2010) [2] in Iran (49.55%) and in the Arsi Administration area (53.72%), according to Wondwossen (1990) [92]. The variations in the research regions' ecological conditions, animal management practices, the intervention of neighboring veterinary practices, sample size, and study period season may be the cause of the discrepancy between the current results and the above findings. These factors are related to the availability of a suitable habitat for the snail intermediate hosts in the study area, which is encourage the development of fluke eggs, miracidiae searching for snails, and cercariae dispersal (Urquhart *et al.,* 1996) [88].
This explanation is consistent with Graber, (1978) [30] and theories. According to these writers, the period at which risk for fasciolosis high occurs when rainy seasons, which facilitate the growth of snails, are quickly followed by arid seasons, which compel animals to feed on small, densely infested marshlands. From the four research sites, there was the highest infection rate of bovine fasciolosis in Tujigabisa. This might be due to the kebele's more conducive habitat for the parasite and its snail intermediate host, as well as variations in sample numbers.
In the current study, a prevalence rate of 59% in female animals and 31.6% in male animals was recorded with a difference between the sexes that is statistically significant (p<0.05). This difference two sexes might be due to male animals are kept at home in the study area for the sake of fattening purposes. Different study by Adem, (1994) [99], Rahmeto, (1992) [62], Hymanot, (1990) [35], Wondowossen, (1990) [35], and Dagne, (1994) [14] all reported findings that are consistent with the current figure. Nonetheless, some researchers discovered a greater frequency in males compared to females. Their rationale is around the management scheme, which allows males to spend more time outside while females are housed indoors during the start of milk production (Balock and Arthur, 1985) [8].
According to our findings, the prevalence of fasciolosis was 52.5% in adults and 35.8% in young. The findings revealed a substantial correlation (P-value = 0.001) between the age of the animals under investigation. current findings was supported by those of Yildirim *et al*., (2007) [95] and Yemisrach and Mekonnen, (2012) [94] showing the lower infection rate in young animals compared to older animals. This could be because fasciolosis in cattle is a chronic illness, and the older age corresponds to a longer duration of infection exposure.

In relation to breed, a prevalence of bovine fasciolosis ($p<0.05$) recorded in Holstein Friensian was higher than that of the local breed. They might be brought on by Holstein Friensian reduced resistance. A statistically significant correlation was observed between the animals' body condition and the occurrence of fasciolosis. According to the current study, the prevalence of infection in animals with poor body condition was highest (90%) compared to the animals with good and medium body condition. This conclusion is supported by research done in Ethiopia by Bekele *et al*. (2014) [9] in Hossana, Ethiopia; Edilawit *et al*. (2012) [21] in Wolaita; Abie *et al*. (2012) [1] in Jimma; and Mihreteab *et al*. (2010) [50] in Adwa. The difference of the prevalence might be brought on due to the fact that animals in poor body condition typically have lower immune systems, making them more vulnerable to a variety of illnesses, such as fasciolosis, as well as lower performance brought on by a lack of vital nutrients and bad management.

Conclusion and Recommendations

The present study showed that bovine fasciolosis is a prevalent disease in study areas affecting the well-being of the animals. This has caused notable direct or indirect losses in studied areas, impeding the production of cattle. The study confirmed that there are significant differences in the prevalence among sex, age, animals' breed and physical state of study animals. Our observation generally suggested that bovine fasciolosis is an endemic condition in the study area and is an indication of the existence of favorable ecological conditions for survival, the multiplication and spread of the intermediate snail host and the parasite in that environment. in designing strategic anthelmintic treatment, It is important to take into account probable risk factors for the disease's onset.

The recommendations that follow are sent in light of the conclusion mentioned above:

- Good pasture management techniques should be used in tandem with the application of strategic therapeutic therapy.
- It is necessary to organise awareness-raising activities for livestock owners regarding the economic importance of the disease and its control strategies in the research area.
- More research on the seasonal dynamics and epidemiological circumstances of parasites in the study area is necessary in order to apply integrated control measures.

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