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A Cross-Sectional Study on Corpological Prevalence and Associated Risk Factors of Bovine Fasciolosis in Gechi District, Western Ethiopia

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ABSTRACT

A cross sectional study conducted on the prevalence and associated risk factors of bovine Fasciolosis in Gechi district, Western Ethiopia. The study aims to determine the prevalence and associated risk factors of bovine fasciolosis from 420 randomly selected local breed cattle. The faecal samples from the cattle were subjected to qualitative coproscopic examination by the standard sedimentation technique for the presence of Fasciola eggs. The study was conducted from November 2018 to end of March 2019. The study showed an overall prevalence of 25.48% and statistical differences between the sampling sites. However, the study showed no significant differences for the risk factors studied (e.g., age, sex, and body composition). This study showed that fasciolosis is prevalent in Gechi, and signifies the need for and intervention through preventive strategies among cattle owners.

Keywords: Bovine; Coprology; Fasciolosis; Gechi; Prevalence; Risk factor

Abbreviations: CSA: Central Statics Agency; DACA: Drug Administration Center Authority; FAO: Food and Agricultural; SPSS: Statistical Package for Social Science; GDP: Gross Domestic Product

INTRODUCTION

Ethiopia has the largest livestock population in Africa and the fifth largest in the world. Livestock is an integral part of agriculture and important component of nearly all farming systems contributing nearly 35% to 40% of agricultural GDP of the country, supporting the livelihoods of a large population by providing draft power for crop production, a source of milk, meat, hides, skins and other products. Currently, the population of livestock found in the country estimated to be 57 million cattle, 30 million sheep and 23 million goats, and 57 million chickens. Though, Ethiopia has substantial livestock resources, its level of productivity is low due to inadequate and imbalanced nutrition, infectious disease, scarcity of water, lack of appropriate livestock extension services, insufficient and unreliable data to plan the services, and inadequate information to improve animal performance and marketing. Among diverse animal diseases recorded in Ethiopia, fasciolosis is a parasitic disease which imposes economic impact on livestock production particularly of cattle and sheep. Fasciolosis, caused by digenean trematokeep in emphasizes of the genus *Fasciola* that is commonly referred to as liver flukes. That the two species, *F. hepatica* and *F. gigantica* are the most commonly implicated etiological agents of this disease. *Fasciola hepatica* and *Fasciola gigantic* have similar life cycles, the adult worm lives in the bile ducts of final host (usually cattle or sheep) and lays eggs which are expelled into the intestine and shed in the faces. If the faeces

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reach freshwater sources, the worm's eggs hatch into larvae called miracidia. Miracidia find Lymnaeid water snails that act as intermediate host. In the snail, miracidia changed to larvae called cercariae, which are released into the water. Cercariae swim to nearby aquatic or semi-aquatic plants where they stick to the stem and leaves and form small cysts called metacercaria. After ingestion by the final host, the young flukes are released from the metacercaria in the small intestine. The peritoneal cavity and the liver tissue into the biliary ducts, where they mature and commence egg production. Fasciolosis is clinically characterized by a chronic, sometimes subacute or acute inflammation of the liver and bile ducts. Subacute fasciolosis is characterized by jaundice, ill thrift and anaemia, whereas chronic fasciolosis produces severe anaemia and chronic inflammation and enlargement of the bile ducts, anorexia, pale mucous membrane and submandibular oedema. Diagnosis of fasciolosis consists of tentative and confirmatory procedures. That tentative diagnosis based on knowledge of the epidemiology of the disease, clinical signs, on grazing history and seasonal, where confirmatory diagnosis based on demonstration of *Fasciola* eggs through standard examination of feces in the laboratory; postmortem examination and serological assays. The affected animals treated with administration of anthelmintic triclabendazole that is effective against young and adult flukes and chemicals toxic to flukes, such as bromofenofos and bithionol in addition to reducing the population of the intermediate host to control the disease. Bovine fasciolosis is an economically important parasitic disease of cattle in tropical and subtropical countries responsible for considerable economic losses in cattle industry. In Ethiopia it is a widely prevalence disease which mostly affects animals. The disease causes a significant economic loss in cattle production by inflecting direct and indirect loss at different parts of the country. The loss mainly occurs through mortality, liver condemnation reduces production of milk, meat and expenditure for anthelmintic. In Ethiopia, both *F. hepatica* and *F. gigantica* are found [1-5]. *F. hepatica*, located in areas with altitude 1800 to 2000 meters above sea level and it was the most important fluke species in livestock with distribution over three quarter of the nation except in the arid North, East and East of the country. While *F. gigantic* appears to be the most common species in areas below 1200 meters above sea level and mainly localized in the Western humid zone of the country that encompasses approximately one fourth of the nations, but both species co-exist in areas with altitude ranging from 1200 to 1800 meters above sea level [6-10]. This disease is widely distributed in areas where cattle are raised and there is a niche for Lymnaeid snail. Cattle were most likely infected with fascioliasis when they graze on the habitat of snail especially grasses in marshy area. That parasitic larva develops to infective metacercaria which is later attached to pasture and infect grazing animals at the edge of water channels. The previous researchers Husen, et al., reported the prevalence of 23.7% bovine fasciolosis in Gechi district, however studies have not yet been fully studied on the corpological, associated risk factors of bovine fasciolosis in the study area. Hence, the objectives of the current study were:

- To estimate the prevalence of bovine fasciolosis in Gechi district.
- To identify the risk factors of bovine fasciolosis in the study area.

MATERIALS AND METHODS

Description of Study Area

The study was conducted in Gechi district from November 2018 up to March 2019. Gechi Woreda is found in Western Oromia region and located at 18 Km from Bedelle town, which is the capital city of Bunno Bedelle zone and 498 Km from Addis Ababa which is the capital city of Ethiopia. The woreda situated at latitude of 8°16'4800'N and Longitude of 36°34'1200"E at elevation of ranging from 140-297 meters above sea level. The study area received mean annual rain fall with an average of 1639.5 mm. The woreda has different climatic classification which includes highland (Dega) 27%, midland (Weyna Dega) 50% and lowland (Kola) 23% and with regard land coverage, marshy area share about 2495 hectare (1 hectare=10,000 m^2) of the total area, which is 48,652.7 hectare [11].

Study Animals

A total of 420 indigenous (local) breed cattle of all age and sex groups privately owned by small holder farmers and managed under traditional extensive system were randomly selected from five randomly selected kebeles of Gechi district [12].

Study Design

A cross sectional study was conducted from November 2018 up to March 2019 to determine the prevalence and associated risk factors of bovine fasciolosis in study area using qualitative coproscopic examination by standard sedimentation technique [13].

Sample Size Determination

For estimation of *Fasciola* prevalence, by using simple random sampling method the sample size was determined by using the standard formula described by Thrusfield.

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

Where,

n=The required sample size

P_{exp}=Expected prevalence

d=Absolute precision

With the expected prevalence of 23.7%, the 95% confidence interval and desired precision was 5%, the required sample size was calculated as 278. However, a total of 420 samples were taken to increase the precision of study [14].

Study Methodology

Sample collection: Sampling was carried out at random with inclusion of age, sex, body condition and origin of animals from four localities. Fecal samples were collected directly from the rectum of each animal and placed in universals bottles and transported to Bedelle regional laboratory of parasitology by preserving with 10% formalin. The fecal samples were kept at +4°C until all are processed and examined.

Parasitologicl examination: Standard sedimentation technique was used to detect the presence or absence of fluke eggs in the fecal sample collected. Three grams of faces was added to 42 mL of water in container. The contents were then mixed thoroughly using a glass rod, and were poured through a tea strainer to remove large debris. The solution was then further passed through sieve (mesh aperture 210 mm) into the container 2 and water was run through the sieve to ensure no eggs remained attached to the sieve. Pour the filtered material in to test tube then allowed to sediment for 5 min, remove supernatant with pipette carefully and re suspend the sediment in 5 mL of water then allowed to sediment for 5 min, discard the supernatant carefully. The latter was stained with two drops of methylene blue and the entire sediment placed on slide covered with a cover slip and viewed under compound microscope at 10x magnification. Eggs of Fasciola species were identified by their characteristic morphology and color. Where eggs of Fasciola species show yellowish color while eggs of Paramphistomum species stain by methylene blue.

Data Management

Data recorded during sampling and laboratory findings was entered in to Microsoft excel spread sheet. The data wasthoroughly screened for errors and properly coded before subjected to statistical analysis. Then from Microsoft excel spread sheet it was processed and analyzed using SPSS version 20 statistical software. Descriptive statistics was analyzed and set as frequencies and percentages. *Chi square* (χ^2) tests were applied to test the statistical associations exist among the associated risk factors (study site, sex, age, and body condition). With that of the presence of the parasites. In all analysis, 95% confidence interval and $P<0.05$ was set for significance [15-18].

RESULTS

Prevalence of Bovine Fasciolosis

The coproscopic examination conducted from November 2018 up to March 2019 showed that from a total of 420 indigenous cattle managed extensively examined for the presence of *Fasciola* using sedimentation technique, 107 cattle revealed *Fasciola* egg in their faces with an overall prevalence of 25.48% in the study area.

Prevalence of Bovine Fasciolosis based on Risk Factors

Out of 420 cattle examined for the prevalence of bovine fasciolosis in Gechi district, 107 (25.48%) cattle were found to be positive for fasciolosis. The higher prevalence was recorded in Yabello site 38 (34.55%) and lower prevalence was in Wakalle site 105 (15.24%). Statistical analysis showed that there was statistically significant variation in the prevalence of bovine fasciolosis ($P<0.05$) among the study site as indicated in **Table 1**.

Table 1: Prevalence of bovine fasciolosis in Gechi district based on sites.

Site	No. examined	No. of positive	Prevalence (%)	95% CI	Pearson *chi-square*
Yabello	110	38	34.55	25.74, 44.21	*Chi-square* value=12.514
Wakalle	105	16	15.24	8.96, 23.56	
Chitu	98	21	21.43	13.78, 30.87	
Mannisa	107	32	29.91	21.43, 39.52	p-value=0.006
Total	240	107	25.48		

From the total numbers of 420 randomly selected cattle 162 of them were male, from which 36 (22.22%) of them were positive for fasciolosis and 258 of them were female, from which 71 (27.52%) of them were positive for fasciolosis. Statistical analysis showed that there was no statistically significant difference ($P>0.05$) in infection rate between the sex groups as indicated in **Table 2**.

Table 2: Prevalence of bovine fasciolosis based on sex groups.

Sex	No. examined	No. of positive	Prevalence (%)	95% CI	Pearson *chi-square*
Male	162	36	22.22	16.07,29.41	*Chi-square* value=1.4708
Female	258	71	27.52	22.16, 33.4	p-value=0.225
Total	420	107	25.48		

During the study period, cattle were classified based on their age as young (≤ 2 years), adult (>3 years) as described by Pasquini. Based on this classification of animals in age, prevalence of bovine fasciolosis was studied in Gechi. From 420 animals randomly selected, 191 of them were young from which 43 (22.5%) of them were positive of fasciolosis, and 229 adult from which 64 (27.9%) of them were positive for fasciolosis. Statistical analysis revealed that there is no statistically significant difference (P>0.05) in prevalence between age group (**Table 3**).

Table 3: Prevalence of bovine fasciolosis based on their age groups.

Age	No. examined	No. of positive	Prevalence (%)	95% CI	Pearson *chi square*
Young	191	43	22.5	16.61, 28.81	*Chi square* value=1.620
Adult	229	64	27.9	22.24, 34.24	p-value=0.203
Total	420	107	25.48		

During the study period cattle were classified based on their body condition scores according to Richard. The body condition results indicate that there was no statistically significant difference between cattle having good, medium and poor body condition (P>0.05), higher prevalence of bovine fasciolosis was observed in poor body condition 39 (29.32%) than moderate 36 (25.4%) and good 32 (22.4%) body condition as described in **Table 4**.

Table 4: Prevalence of bovine fasciolosis based on their body condition scores.

B/condition	No. examined	No. of positive	Prevalence (%)	95% CI	Pearson *chi square*
Poor	133	39	29.3	21.75, 37.83	*Chi square* value=1.861
Moderate	126	36	25.4	18.06, 33.92	p-value=0.394
Good	161	32	22.4	16.17, 29.58	
Total	420	107	25.48		

DISCUSSION

Bovine fasciolosis exists in almost all regions of Ethiopia. However, the prevalence varies with locality that was caused by the variation in the climate and ecological conditions such as altitude, rainfall, temperature, livestock management systems. The overall prevalence of bovine fasciolosis in present study 25.48% was relatively higher as compared with the study previously conducted by Husen, et al. That reported 23.7% of prevalence rate in the same study area. The reason for increased prevalence of the disease could be due to increase irrigated land masses from the currently constructed ponds and the tendency of farmers to feed their animals in these marshy and pond areas because of feed scarcity, similar observation supporting the present study was reported by Terefe, et al.

In the other way, the present result 25.48% was relatively comparable with 25% prevalence reported by Senait, et al., at WereJarso woreda, and 26% reported by Legesse et al. at Zelzelma Bahir Dar, and the result was lower when compared with higher prevalence of 39% by Gojam and Tulu at Ambo district, 30.02% by Asmare and Samuel at Dangila district, 27.6% by Tulu and Gebeyehu at Jimma Horro district, 32.3% by Gebrie, et al. at Bahirdar, this prevalence vary with locality were caused by the variation in the climate and ecological

conditions such as altitude, rainfall, temperature, livestock management systems in the country.

According to the present study there was a significant difference in the prevalence of *Fasciola* infection in relation to site from where animals are sampled (P<0.05). The highest prevalence was recorded in Yabello (34.55%) followed by mannisa (29.91%), chitu (21.43%) and the lowest in Wakalle (15.24%). This difference was due to their location, where Yabello and mannisa near to the Dadeysa river that is permanently wet and water logged, the presence of marshy area in Yabello called Hora that animals drink daily and graze around, and there was also small borehole in a different place that people made for plants growth like: Khat, potato, tomato, etc. that create favourable condition for development of both the snail and the parasite, where the two rest sites chitu and wakalle are dry.

In the current study, the prevalence of fasciolosis didn't show a statistically significant difference (P>0.05) between females (27.52%, n=71) and males (22.2%, n=36). This finding agrees with the study of Gemechu, Tolosa and Tigre and Ashebir, et al., and disagree with the previous study by Karshima, et al. The sex group has no effect on infection rate, this could be that both sexes move together in search of food and water and therefore same possibility for both sexes to be equally exposed to the risk of infection, moreover, fasciolosis was not a disease directly related to animal reproductive system.

In the present study, a prevalence of 22.5% (n=43), and 27.9% (n=64) was recorded in young and adult animals respectively. There was no statistically significant difference (P>0.05) between age group, this means age has no impact on the prevalence of fasciolosis, this study agree with the result reported by Tizazu and Ahmed, Tsegaye, et al. and contradicts with the result of Alula, et al. Solomon and Abebe and Daksa, et al. The explanation for this study showed that age groups have no effect on prevalence of fasciolosis, hence both animals were equally exposed to infection and samples were collected from grazing area or field where both animals shared grazing lands and watering points.

The prevalence of bovine fasciolosis was a statistically analyzed relatively on the bases of body condition to determine the impact of the disease in animals with different body condition scores and a prevalence of 29.32% (n=39) in poor 25.4% (n=36) in medium and 22.36% (n=32) in good body condition was found on examination. This result indicated that the occurrence of bovine fasciolosis has no statistically significant difference (p>0.05) in relation to body condition of the animals. The result of the current study was consistent with the result reported by Hagos and Kebede, when it disagree to the result reported by Tulu and Gebeyehu, Bekele, et al., who revealed that there was a statistically significant difference (P<0.05) in relation to body condition of the animals. This might be poorly nourished animals appear to be less competent in getting ride off infection although it is not unusual for well-fed animals to succumb to the disease. Similarly, other infections (parasitic or non-parasitic) might make poor body condition animals susceptible to fasciolosis [19-22].

CONCLUSION

Bovine fasciolosis is a major problem in animal production which causes The loss mainly occurs through mortality, liver condemnation reduces production of milk, meat and expenditure for anthelmintic. The results of this study indicated a higher prevalence of bovine fasciolosis in Gechi district. The occurrence of fasciolosis was closely associated with the presence of suitable environmental conditions for the development of snails. The study area is suitable for the survival of the snail which worsens the situation for the future. Prevalence reported in this study has clearly indicated lack of strategic control measures against the disease and due to the risk of water masses and ponds at grazing areas and the tendency of farmer 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.

RECOMMENDATION

Based on this conclusion the following recommendations are forwarded:

- Either draining or fencing of marshy area to protect animals from infection during grazing.
- Creation of awareness to cattle owners on control methods of fasciolosis.
- The use of trematocidal drugs known to be effective against young and adult flukes.

CONFLICTS OF INTEREST

No conflicts of interest.

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