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Research Article

Prevalence and Associated Risk Factors of Bovine Fasciolosis at Jima Rare Woreda, Ethiopia

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Abstract

A cross sectional study was conducted to determine prevalence and associated risk factors with fasciolosis in cattle at Jima Rare district, Ethiopia from June 2022 to November 2022. Examinations of the fasciolosis egg were performed by using sedimentation techniques. A total of 380 faecal samples from cattle were subjected to coprological investigation. Out of this 133 were positive for egg of *Fasciola* with an overall prevalence of 35% (133/380). The prevalence was 21.7% (20/92), 57.5% (54/94), 48% (46/96) and 13.3% (13/98) in Lenca Guracha, Dile kolba, Bebala and Misoma Dangago respectively. The variation of prevalence among kebeles were showed statistically significant difference ($P<0.05$). The prevalence rates of fasciolosis based on sex were 35.5% (64/185) in females was higher when compared to 34.6% (69/195) in male sheep. However, the difference is not statistically significant ($P>0.05$; $X^2=0.03$). Higher prevalence rate in adults 35.5% (65/181) was recorded when compared to young animals 34.2% (68/199). However, the difference is not statistically significant ($P>0.05$; $X^2=0.13$). The prevalence rate among body condition is indicates that 43.2% (63/146), 34.8% (47/135) and 23.2% (23/99) in cattle with poor body condition, medium and good respectively. The analysis of data showed statistically significant ($P<0.05$; $X^2=10.3$). As conclusion bovine fasciolosis was prevalent in district, thus causing major economic loss in the study area. Hence, control strategies targeted on the parasite and the intermediate hosts as well as implementation of appropriate grazing management in the study area were warranted.

Keywords: Bovine; Fasciolosis; Jima rare; Prevalence; Risk factors

Introduction

Fasciolosis is the most important Trematode of domestic ruminants and is the commonest of liver fluke. Its complete life cycle is realized by the presence of suitable intermediate host under favorable condition. Snail is the essential intermediate host for the development of Miracidium through Metacercariae which is an infective stage for the final host [30].

Fasciolosis can be caused by the *F. hepatica*, which is widely distributed in temperate and cooler areas of high altitude in tropics and subtropics areas and *F. gigantica* which is widely distributed in tropical areas. Fasciolosis, caused by this two species are highly prevalent helminth infections of ruminants in different parts of the world. It causes significant morbidity and mortality. The disease is usually characterized by a chronic, sometimes acute or sub-acute inflammation of the liver and bile ducts, accompanied by sub-mandibular oedema, anemia, anorexia, general intoxication and death. It is an important limiting factor for bovine production. Several economic losses can occur due to flukes cause severe liver damage and result in total condemnation of liver [21].

Bovine fasciolosis is diagnosed of based on clinical sign, grazing history, seasonal occurrence, examination of faces by laboratory tests and post-mortem examination. In cattle, chronic form of the disease is more common and drugs like rafoxanide and nitroxynil other than triclabendazole are more effective. The disease can be controlled by reducing the population of the intermediate host or by using anthelmintics [23].

Fasciola 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 Fasciola gigantica was mainly localized in the western humid zone of the country that encompasses approximately one fourth of the nations [29].

There are many reports from different parts of the country

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by different researchers on prevalence bovine fasciolosis and its associated risk factors. However, there are no reports on prevalence and associated risk factors of bovine fasciolosis in present study area. Hence, this study was conducted to study prevalence of bovine fasciolosis and its associated risk factors at Jima Rare district.

Materials and Methods

Study Area

This study was conducted in Jimma Rare Woreda, Horo Guduru Wollega Zone, Oromo regional State, Ethiopia. The woreda has 18(eighteen) rural kebeles and two urban administrative towns. Out of this 4 (four) kebeles namely Misoma Dangago, Bebala, Lenca Guracha and Dele Kolba were selected for this study. The study area is located at an altitude between 1650-2650m with an average 2150m above sea level. The temperature of the area varies between 18°C -25°C, with average 21.5°C and the annual average rainfall is around 1150mm. The area has subtropical (weyndega), tropical (kola) and temperate (dega) type of climate division and accounting for 72%, 0% and 28% respectively. The livestock population of the district was estimated at 123,023 cattle, 42,506 Sheep, 31,447 goats, 10,542 horses, 875 mules, 6,064 donkey and 75,600 poultry (Jima Rare Woreda Agriculture office, 2022) (Figure 1).

Study Animals and Sampling Method

Randomly selected cattle from the 4 (four) kebeles; namely Misoma Dangago, Bebala, Lenca Guracha and Dele Kolba were included in the study. The simple random sampling method was also applied during sampling animals. The fecal sample collected directly from the rectum of the animals was preserved by formalin before transported to laboratory. In this study, both sexes and all age groups of cattle were included to study.

Study Design

For this study cross-sectional study designs were used to determine the prevalence of fasciolosis in cattle. Simple random sampling methods were used to sample individual animals [28]. Information such as sexes, ages and body conditions of all the sampled cattle were recorded. The body condition scoring was classified into three categories: poor, medium and good body condition.

Sample Size Determination

The required sample sizes for this study were determined based on the expected prevalence of fasciolosis in the area 55.7% (Shako & Oljira, 2016). The 5% desired absolute precision and 95% Confidence Interval (CI) were used according to Thrusfield (2005):

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

Where:

n= required sample size

P_{exp}= expected prevalence

d^2= Desired absolute precision confidence level =95%

$$n = \frac{1.962 \times 0.557 (1-0.557)}{(0.05)^2}$$

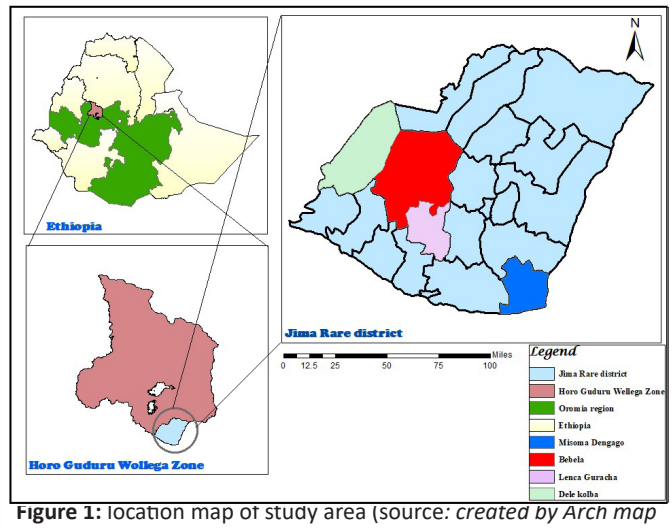

Figure 1: location map of study area (source: *created by Arch map 10.3 software*).

Based on this the calculated sample size for this study were 380 cattle.

Study Methodology

Sample collection and carpological examination: Feacal sample collections were performed directly from the rectum of the animal by using glove and sampling bottle. Fecal sample collected from kebeles those having distance from laboratory are preserved by formalin before they transported. Examinations of the fasciolosis egg were performed according to (Bayou, 2005); about 3gm of feces was collected from the rectum of each selected cattle using sample bottle. The fecal sample was crushed with mortar and pestle and 40-50ml of tap water was added and mixed with fork and filtered the fecal suspension through a tea strainer into a beaker, the filtered material should be poured into a centrifuge tube. After balance the centrifuge tubes, centrifuged the sample at about 1500 rpm for three minutes the supernatant fluid was discarded carefully using a pipette and bulb, 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 40x magnification power. Positive sample was based on presence of egg with yellowish brown shell which has an indistinct operculum and embryonic cells.

Data Analysis

Data collected from laboratory result was stored on Microsoft excel spread sheet 2010 program, and analysis were done by using STATA Version 16 software program. The total prevalence was calculated by dividing the number of fasciola positive animals by the total number of animals tested or sampled. Pearson's chi-square (x^2) was used to evaluate the association of different variables with the prevalence of fasciolosis. P-value of <0.05 were considered significant in all the analysis.

Result

Overall Prevalence of Bovine Fasciolosis

In this study, a total 380 feacal sample of cattle were examined for fasciolosis from four kebeles. Out of this 133 samples were positive for fasciola eggs with overall prevalence of 35%. The prevalence of Fasciolisis in relation to kebeles was, 21.7% (20/92), 57.5% (54/94), 48% (46/96) and 13.3% (13/98) in Lenca Guracha, Dile kolba, Bebala and Misoma Dangago respectively. High prevalence rate were recorded in Dile kolba and Bebala kebeles compared to Lenca Guracha and Misoma Dangago. The difference in the prevalence of bovine fasciolosis in

cattle sampled among four selected kebeles were statistically significant (P<0.05) (Table 1).

Association of Risk Factors with the Occurrence of Bovine Fasciolosis

The analysis of risk factors for association using the chi-square test revealed that the prevalence of fasciolosis showed statistically significant association with kebeles (P<0.05; X^2=55.31).The prevalence rates of fasciolosis in female animals 35.5% (64/185) were higher when compared to male animals 34.6% (69/195). However, the difference is not statistically significant (P>0.05; X^2=0.03). In another way the association of prevalence rates of fasciolosis in relation to age group were tried to show in this current study. Accordingly, the prevalence rate in adults 35.5% (65/181) was higher when compared to young animals 34.2% (68/199). However, the difference is not statistically significant (P>0.05; X^2=0.13) (Table 2).

The prevalence of fasciolosis was found to be higher in cattle with poor body condition than those with medium and good body condition ones and the prevalence was 43.2% (63/146), 34.8% (47/135) and 23.2% (23/99) in cattle with poor body condition, medium and good body condition respectively. The difference in infection rate among body condition of animals was showed statistically significant (P<0.05; X^2=10.3) (Table 3).

Table 1: The overall prevalence of bovine Fasciolosis in different kebeles.

Study Kebeles	No Examined	No_Positive	Prevalence (%)
Lenca Guraca	92	20	21.7
Dele Kolba	94	54	57.5
Bababala	96	46	48
Misoma Dangago	98	13	13.3
Grand total	**380**	**133**	**35**

X^2=10.3, P=0.00

Table 2: The prevalence of bovine fasciolosis in relation to Kebeles, Sex, Age and Body condition.

Risk factors	No examined	No positive	Prevalence (%)	X^2	P-value
Kebeles					
Lenca Guraca	92	20	21.74	55.31	0.00*
Dele Kolba	94	54	57.45		
Bababala	96	46	47.97		
Misoma Dangago	98	13	13.3		
Grand total	380	133	35		
Sex					
Male	185	64	34.6	0.03	0.87
Female	195	69	35.4		
Grand total	380	133	35		
Age					
Young	199	68	34.2	0.13	0.72
Adult	181	65	35.9		
Grand total	380	133	35		
Body condition					
Good	99	23	23.2	10.3	0.006*
Medium	135	47	34.8		
Poor	146	63	43.2		
Grand total	380	133	35		

*=Statistically significant value; X^2=Chi square test

Discussions

Fasciolosis is a prevailing ruminant health predicament and causes substantial economic losses to the livestock commerce in Ethiopia. The prevalence indicated by fecal examination in the present study 35% was higher than the 25.2% prevalence reported from Desse by Belay *et al.,* (2012). But the result was lower than the prevalence reports 87% from Debrebrihan by Tsegaye T (1995). The reason of the deference in the prevalence may be related to the diversity of agro-climate conditions, management system of the animal or altitude of the study area. Accordingly, the prevalence of the ovine fasciolosis in present study area in deferent kebeles were 21.7%, 57.5%, 48% and 13.3% in Lenca Guracha, Dile kolba, Bebala and Misoma Dangago respectively. This variation in result might be due to the variation in presence of swampy lands which is favorable for population of intermediate host (snail) between kebeles. In another way the swampy areas were important ecologies for the continuity of the lifecycle of fasciolosis. Similar findings were previously reported by Solomon and Abebe (2007).

Young animals had a lower prevalence of Fasciola spp infections in this study. This finding was consistent with other reports, and it was not surprising because of maternal immunity. Higher infection rates were found in adults in other age groups. Based on this finding, it can be suggested that the higher exposure risk of adults may be due to physiological differences, such as stress, pregnancy, calving, inadequate nutrition, and infectious diseases. Similar results were reported by Ayalew (1994).

In this study, a higher prevalence of parasitic infection was in recorded in female animals compared to males. However the discrepancy is not has a significant role of association (p>0.05). The fact that prevalence of fasciolosis between male and female are not significantly difference is may indicate that sex of has not impact on the prevalence of fasciolosis. They exposed to graze and parasitic infection with equal rate. This result is Similar to the observation done by Molalegne *et al*. (2010).

In the current findings highest prevalence of *Fasciola* infection was detected in cattle with poor body condition followed by medium and good body condition scores. The high prevalence of *Fasciola* infection in poor body condition animals could be justified by the fact given by Devendra and Marca (1983) who indicated animals of poor body condition were susceptible to parasitic diseases. The significant variation in the prevalence of fasciolosis in relation to body condition could be further justified by the fact that *Fasciola* worms are known to suck blood and tissue fluid and even damage the parenchyma of the liver due to the migrating immature worms (Marquardt *et al.,* 2000). It can also be further justified by the fact that cholangitis and liver cirrhosis induced in chronic fasciolosis could reduce bile flow to the duodenum and hence reduced lipid emulsification, digestion and absorption of good acid and lipid soluble vitamins. This finding confirmed the importance of fasciolosis in causing weight loss and emaciation as a characteristic sign of the disease [22].

Conclusion and Recommendations

Bovine Fasciolosis is an important helminth parasitic disease and one of the major obstacles for livestock development in Ethiopia causing remarkable direct and indirect losses in different parts of the country. In this study the prevalence of bovine fasciolosis in cattle reared under extensive farming system in Jimma Rare district determined. The prevalence of the disease

based on faecal sedimentation test in this district was considerably higher in cattle live in kebeles such as Dele kolba and Babala. The discrepancy and similarity in the prevalence between the various kebeles might be related to the high accessibility of marshy lands or swampy lands which is favorable for the life cycle of intermediate host. Estimated 5800hector lands of the district were covered by swampy lands which might be reason for high prevalence rate of fasciolosis in district (Kebede S, Oljira W, 2016). For this reason the prevalence of fasciolosis can be high in some kebeles. High prevalence rate were determined in cattle with poor body condition score rather than with medium and good ones. This indicates that fasciolosis parasitic disease causes loss of weight that put the owners or farmers into bankruptcy. The prevalence of bovine fasciolosis was not associated with sex and age of cattle in the study area. However, the present study result revealed that the prevalence of bovine fasciolosis was associated with kebeles and body condition in the study area.

Based on the above findings the following recommendations are forwarded:

Regular deworming program have to be designed and implemented to minimize the effect of the disease. As well as Collaboration between different sectors should be done so as to control both disease and vectors of an area. In another way the prevalence and effect of the parasite in the in other livestock and human was unknown at the woreda, so further epidemiological studies on fasciolosis is recommended.

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