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Agro-Ecological Difference in Prevalence and Associated Risk Factor of Bovine Fasciolosis in Wolaita Zone, Ethiopia: Field Survey

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ABSTRACT

Fasciolosis is one of helminthes disease of ruminants which can cause negative impact on production and health. This disease also can cause huge economic losses in livestock production system in different agro-ecology of Ethiopia. The study aimed to determine the prevalence and associated risk factors of bovine fasciolosis in Gesuba town, Offa, Bayira koyisha, Kawo koyisha districts of Wolaita zone. Cross sectional study was carried out from January 2022 to May 2022. Thus, a total of 384 cattle were randomly selected and coprological diagnosis of faeces for fasciola egg and ($p<0.05$) checked for existence of association between risk factors. The prevalence of field survey was found to be 11.2% on coprology. The occurrence of diseases was associated with different risk factors. When observing the risk factor for disease occurrence, agro-ecology, sex and body conditions were risk factors ($P<0.05$) but age and management system ($P>0.05$) have no association with disease occurrence. In conclusion, the prevalence of fasciolosis in the study area was very low when comparing with other researcher's reports and it may relate with the study period. So, Strategic treatment of cattle with appropriate flukicidal drugs, a combination of control measures including drainage, fencing, mulluscicides and awareness creation should be applied.

Keywords: Agro-Ecology; Bovine Fasciolosis; Prevalence; Risk Factor; Wolaita Zone

Introduction

In developing countries, within the agricultural sector livestock provides an important role to rural livelihoods particularly those of the poor (Upton, [1]) in the form of household income and nutrition (Azage, et al. [2]). However, the livestock sector is constrained by several factors including poor genetics, low reproductive performance, and poor quality and varying seasonal availability of feed, high disease incidence and parasite challenges, and low accessibility to services and inputs (Azage, et al. [2]; Management Entity [4]). Among the livestock diseases which can hinder animal health are parasitic infections that have great economic impact (Abdulhakim, Addis, [4]) and problems of farm animals (Yusuf et al., 2016). Fasciolosis is the most common and economically important parasitic disease which can affect the health and production of animals (Yusuf, et al. [5,6]).

Bovine fasciolosis is a caused by genus fasciola and contains two common species of *Fasciola gigantica* and *Fasciola hepatica* (Mihreteab, et al., 2010). The presence of *F. hepatica* and *F. gigantica* in Ethiopia has long been known with its prevalence and economic significance as well (Rahmeto, et al. [7]). Fasciola has oval shape egg and yellowish brown shell with an indistinct operculum (Urquhart et al, 1996; Asefa and Tegegne, 2018). In Ethiopia, the distribution of *F. hepatica* was localized to over three quarter of the nation except in the arid northeast and east of the country and *F. gigantica* shown to be localized in the western humid zone of the country that encompasses approximately one fourth of the country (Gebrie, et al. [8]). Similarly, the distribution of *F. hepatica* and *F .gigantica* infections occur in areas above 1800 m and below 1200 m above sea level respectively but they can intercept

at ecology which is conductive for both snail hosts (Yilma, et al. [9]). The disease prevalence is related to presence of marshy areas and existence of a large population of the snail intermediate host in an area (Asefa and Tegegne, 2018). The most common snail's species exist in Ethiopia are *L. truncatula* and *L. natalensis*. They are intermediate host for *F. hepatica* and *F. gigantica* respectively (Biruk [10]). The near time coprological prevalence of bovine fasciolosis from different part of country reported 6.5%, 9.52%, 14.83%, 16.6% 19.53%, 20.8%, 32.3%, 36.5%, 39.06%, 42.9% 47.10% and 62.3% Habtemichael, et al. [6,11-20] respectively.

The prevalence and associated risk factor for bovine fasciolosis occurrence studied in different corner the country in detail but there is no research work has been conducted and documented data in study area.

Therefore, the objectives of this study were:

1. To determine the prevalence of bovine fasciolosis in different agroecology of study area.
2. To determine associated risk factors for occurrence of fasciolosis

Materials and Methods

Study Area

Gesuba town, Offa district, Baliko segno and Kawo koyisha district are found in wolaita zone of the southern nations, nationalities, and peoples region. The approximate distance from the town of Sodo is about 16km - 52km to Southwest. The distance from Addis Ababa, the capital of Ethiopia, is 336 km-372km via Butajira- Sodo to south. The areas are located at elevation of 1000-2800 meter above sea level and lie between about 6o43'27" - 60 44' 59.99N, 370 29' 59.99 - 37o33'24"E. The mean annual rainfall ranging between 900 and 1200mm and average temperature is 14ºc-34ºc. Livestock resource of study area comprises of 312,868 cattle, 163,893 sheep, 227,369 goats, 358,793 poultry, 5845 horse, 7,378mules and 33,277 donkeys (OWARDO, 2011; BKAGO, 2021; GTAO, 2021; KKAGO, 2021) (Figure 1).

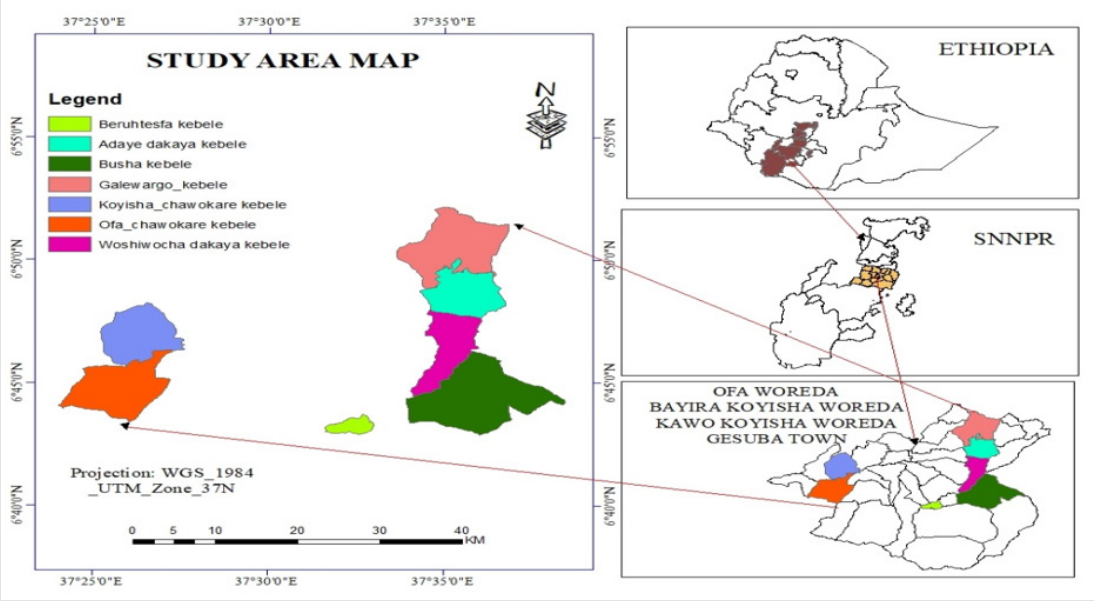

Figure 1: Study area of Map. Source: (WZAD, 2022).

Study Population

All animals in Kawo koyisha district, Bayira koyisha district, Offa districts and Gesuba town which were managed in different management system are the population of study.

Sample Size Determination

The sample size was calculated according to Thrust field (2005) by taking the prevalence of 50% since there was no previous study conducted in the study area. The sample size calculated was 384 with 95% confidence interval and 5% expected error.

$$n = \frac{1.962\ Pexp(1 - Pexp)}{d^2} = \frac{1.96^2\ (0.5)(0.5)}{0.05^2} = 384\ sample$$

Whereas: n = required sample size; Exp = expected prevalence; d = desired absolute precision

Study Design

Cross sectional study was conducted from January 2022 to May 2022 to determine prevalence and associated risk factors for occurrence of disease in different agro ecology of study area. The study ar-

eas were selected purposively whereas the individual animals were selected by simple random sampling method. All available information regarding the animal was recorded to data recording format and to fecal sample container. The fecal sample was collected directly from the rectum of the animals and added to universal bottle containing 10% formalin and transported to Wolaita Soddo Regional Veterinary Laboratory for coprological examination. Sedimentation technique was used to detect the presence or absence of fluke eggs in the fecal sample (Hanson and Perry, 1994). In laboratory procedure, a drop of methylene blue solution was added to the sediment to differentiate eggs of Paramphistomum species and Fasciola species, where eggs of Fasciola species show yellowish color while the eggs of Paramphistomum species stain by methylene blue (Antonia et al., 2002).

Data Analysis

Data generated from laboratory diagnosis were directly recorded and coded using SPSS version 20 statistical software and analyzed. Descriptive statistics was used to determine the proportion of diseases based on sex, peasant associations (kebele), agro-ecology, body condition and age. Chi-square test and the p-value were used to determine the presence of association among the different variables and disease. P-value was set to check whether there is existence of significant or not. The total prevalence obtained by calculating and dividing the number of disease positive animals by the total number of animals examined.

Results and Discussion

The overall prevalence of fasciolosis on sedimentation revealed 43/384 (11.2%) found to be infected with Fasciola egg. The present result revealed the prevalence of bovine fasciolosis was very low. This might be due to the period of study conducted was dry season which was characterized by existence of increased environmental temperature which hinder development of both parasite and intermediate host, uneven distribution of fasciola egg throughout the faeces and the intermittent nature of expulsion of fasciola egg with animal faeces from gall bladder. This result lower than the research work conducted in different part of Ethiopia Yilma, Mesfin [21] 33.42% in North Gonder, Biniam, et al. [22] 42.25% in and around Woreta, Fikirtemariam, et al. [23] 36.72% in and around Bahir Dar, Yosef, et al. [15] 20.8% in Bedelle district, Yitayal, et al. [16] 41.41% in and around Bahir Dar, Asmare, Samuel [24] 30.02% in and Around Dangila District, Asefa and Tegegne (2016) 34.23% in Wulnchit, Ayele, et al. (2018) 62.33% in and around Debire Birhan, Abiy, Dereje [18] 39% in and around Ambo and Girma and Delelegn (2019) 19.5% in hirna and its surroundings. The difference in prevalence of bovine fasciolosis in different part of the nation might be due to the season of study conducted, availability of livestock population near to marshy and swampy area, wide field of communal grazing land containing pocket of water lodge, availability of intermediate host (snail) and agro-ecology of the study area.

However, the current result was comparable to the report of Daniel [25] 14.4% in Dire Dawa, Abunna et al. (2009) 4.9% in Wolaita Soddo, Ibrahim, et al. (2010) 12.4% in Kombolcha, Debela, et al. [26] 12.5% in Aira and Gulliso District. Difference in prevalence among geographical locations is attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature. Fasciola prevalence has been reported to vary over the years mainly due to variation in amount and pattern of rainfall (Miheretab, et al., 2010). Based on the study area, Offa district, Bayira-koyisha district, Kawo-koyisha district and Gesuba town, the prevalence of fasciolosis were 5/ 97(5.15%), 9/106(8.49%), 25/123(20.3%) and 4/58(6.9%) respectively. Significant difference (P=0.014) in infection within the present study was observed (Table 1). This indicated the prevalence of fasciolosis related with the study area. This much prevalence of bovine fasciolosis observed in study area might be due to agro ecological condition favorable for parasite (fasciola) and intermediate host (snail) multiplication; climatic condition such as the pattern of rainfall, altitude and temperature; existence of swampy and marshy grazing land, and population of animal in area.

Table 1: Prevalence of bovine fasciolosis on coprological examination of study area.

Districts	kebele	positive	T/sample	P%	X2	P-value
Offa	Busha	3	57	5.26	15.882	0.014
	Woshiwocha	2	40	5		
Bayira Koyisha	Gale-wargo	5	62	8.06		
	Adaye-dekeya	4	44	9.09		
Kawo koyisha	Offa chawu kare	13	67	19.4		
	Koyisha-chawu kare	12	56	21.43		
Gesuba	Biru-tesfa	4	58	6.9		

The prevalence of bovine fasciolosis observed in three agro-ecology lowland 4/58(6.9%), midland 14/203 (6.9%) and highland 25/123 (20.3%) which was statistically significant (P=0.001). The result indicated the prevalence of fasciolosis was high in highland. This might be due to highland increases the chance of survival of intermediate host even on dry season and the wetness of the area stay for long time. Solomon, Abebe (2007) explained as Ethiopian highlands contain pockets of waterlogged marshy and swampy areas which pro-

vide suitable habitats year-round for the intermediate host of fasciola. The prevalence of fasciolosis in sex difference were observed female 19/228(8.3%) and male 24/156(15.38%) which was indicated statistically significant (P= 0.031) difference between sex groups. This finding is in line with the report of Ayele, et al. (2018) who tried to show the variation in sex for occurrence of bovine Fasciolosis. This might be due to physiological status, sex discriminated care for animal, presence or absence of communal grazing land, management system and ploughing land for farming.

In current study sex has effect on occurrence of disease which could explain by male animals been more infected than female. This could be due to topographical uncomfortability for farming the use of males for ploughing purpose is very less. This given low attention for males and grazed on communal grazing land and easily harbor the parasite from the field and females get high care from farmers due to female animal give milk for home consumption, young female (heifers) are successor of aged female lactating animal and enable to get new calf and female animals get high care by tying in front of house and managed intensively thereby it give low chance to harbor parasite from field. However, this study finding is not similar with the reports of Rahamato, et al. [7,15,27], Feleke, Girma (2018), Bayou, Geda (2018), Chaluma, et al. [19] who has concluded sex has no effect on occurrence of bovine fasciolosis and hence both male and female are equally susceptible and exposed to fasciolosis.

The prevalence of bovine fasciolosis in different age groups observed statistically not significant (P= 0.077). This indicates age has no effect on occurrence of fasciolosis. This report in line with the research works of Yosef, et al. [15], Mandefrot, et al. [28] and Ayele, et al. (2018). This could be due to all age grouped animals were grazed on communal grazing field without discriminating at its age group at the same time and they feed on field together. The prevalence of fasciolosis based on body condition in poor body condition 29(16.38%), medium body condition 12(6.9%) and good body conditions 2(6.06%) were recorded. The statistically significant (P = 0.012) indicating body condition was directly related to infection of fasciola (Table 2). This finding corresponds with the reports of Keyyu, et al. [29-34], Mahendra, et al. (2015) and Abebe et al. (2018). Poor body conditioned animals were more affected than medium and good body conditioned animals. This might be due to the feeding habit of parasite depending on blood meal which could cause losses of body weight, predispose to other diseases and decreases immune system of animal.

Table 2: Prevalence of bovine fasciolosison coprological examination and associated risk factors of study area.

Risk factors		Positive	T/sample	P %	X 2	P -value
Agro ecology	Lowland	4	58	6.9	15.161	0.001
	Midland	14	203	6.9		
	Highland	25	123	20.3		
Sex	Female	19	228	8.3	4.631	0.031
	Male	24	156	15.38		
Age	Young(<6yr)	13	58	22.4	5.122	0.077
	Adult(6-8yr)	17	141	12.05		
	Old (>8yr)	13	201	6.47		
Body condition	Poor	29	177	16.38	8.901	0.012
	Medium	12	174	6.9		
	Good	2	33	6.06		
Management	intensive	5	35	14.28	0.472	0.79
	Semi intensive	20	175	11.43		
	Extensive	18	174	10.34		

Prevalence of bovine fasciolosis in different management system seemed 14.28% intensive, 11.43% semintensive and 10.34% extensive and this was statistically insignificant (P=0.790). This indicated all management systems had approximately equal chance to be diseased. This might be due to people now time challenged of lack of enough grazing land, some people prefer to manage either intensively or semintensive, extensive because of communal grazing land most of the time it contaminated with animals' faeces, it contains lodge of water which favour the development of intermediate host. However, the swampy area enhances the development of grass which attract the animal owner to mow the grass and this grass may harbuor the parasite and consumed by animal managed either intensively or semintensively, extensively.

Conclusion and Recommendations

Current study revealed the prevalence of bovine fasciolosis in selected districts of wolaita zone was very low when compared to current time research work of others and it might be due to study conducted from January to May, these months almost dry and the fluc-

tuation of rain and over sun light may affect the snail breeding and fasciola life cycle in the area. However, the occurrence of fasciolosis was associated with agro-ecology, sex and body condition but age and management system has no effect on occurrence of fasciolosis. Based on the conclusions the following recommendations are forwarded:

1. To control the transmission and distribution of fasciolosis, Wolaita zone government, veterinarians, animal health extension staff, laboratory technicians and meat inspectors should contribute their respective effort.
2. The epidemiology of fasciolosis and ecology of intermediate host (snails) detailed studies should be conducted.
3. Strategic treatment of cattle with appropriate flukicidal drugs, a combination of control measures including drainage, fencing, mulluscicides and awareness creation should be applied.

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