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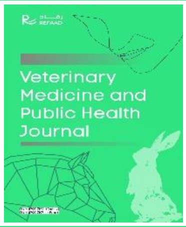

Bovine Fasciolosis in Wolaita Zone, Southern Ethiopia: Prevalence, Economic Loss, Risk Factor and Coprology

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Abstract

Fasciolosis is one of helminthes disease of ruminants caused by genus Fasciola and contains commonly occurring fasciola species: fasciola gigantica and fasciola hepatica. This disease is tropically neglected disease which can causes huge economic losses in livestock production. The study aimed to determine the prevalence, financial losses, associated risk factors and coprology of bovine fasciolosis in selected distric's municipal abattoir of Wolaita zone. Cross sectional study carried out from January 2022 to May 2022. Thus, a total of 400 cattle were randomly selected and detailed examination of liver and faeces for liver flukes and fasciola egg and ($p<0.05$) was checked for existence of association between risk factor, financial losses was calculated, and specificity and sensitivity calculated to see diagnostic efficacy. The prevalence of abattoir was found to be 8.5% on coprology and 14.5% postmortem. The commonly identified liver fluke species affecting the cattle in study area was F. hepatica 48.28% (28/58), F. gigantica 27.58% (16/58), mixed infection 24.14.0% (14/58). The current financial losses of study area totally recorded 5,614,657.68 ETB/ 80,209.40USD. The sensitivity and specificity of coprology was found to be 58.6% and the 100% with substantial agreements (kappa=0.71) between the two methods. When observing risk factors for occurrence of diseases: agro-ecology, sex and body conditions were risk factors ($p<0.05$) but age ($p>0.05$) has no association with disease occurrence. In conclusion, the prevalence of fasciolosis in study area was very low when compare with other researcher's reports but caused huge financial losses to meat sellers. In diagnostic method postmortem is more sensitive than coprology. 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: *Abattoir; Bovine fasciolosis; coprology; postmortem; financial losses; Prevalence; Risk factor; Wolaita zone.*

1. Introduction

Background of the Study:

In many areas of the tropics, livestock rising is an important economic activity from which food and non-food commodities are derived (Rege and Lebbie, 2000). Ethiopia has large number of livestock resource and practice different production systems (CSA, 2020) but the livestock production system is predominantly extensive with indigenous breeds and low input/lowoutput husbandry practices (ME, 2021). However, this sector contributes multiple functions include environmental service, household income, nutrition security, ploughing, transport, job creation, manure as fuel, security in times of crop failure, and means of wealth accumulation and earning foreign currency (Tegegne and Feye, 2020). The sector contributed up to 40% of agricultural Gross Domestic Product (GDP), nearly 20% of total GDP, and 20% of national foreign exchange earnings in 2017 (World Bank, 2017).

Livestock productions constrained by technical and institutional factors. Institutional factors include poor linkages between technology sources such as research centers and end users, and limited extension and financial services. The technical constraints include insufficient and low-quality feed, widespread prevalence of diseases, as well as poor genetic makeup of the animals, in part due to unavailability or prohibitive prices of improved breeds (MOA, 2013).

Existence of parasitic diseases in all agro-ecological zones of the country can adversely affect the productive and reproductive potential of domestic cattle (Shapiro *et al*., 2015). Trematode is one parasitic disease containing the genus fasciola which can causes wide spread ruminant health problems at its developmental stages and in its migratory phase (Umer and Mulugeta, 2018). Fasciolosis is disease of sheep, goat, cattle (Musotsi *et al*., 2017) and occasionally result human infection (Mekky *et al*., 2015).

Fasciolosis, caused by genus fasciola, and it is one of the most important food and water-borne parasitic zoonoses (Mas-Coma *et al*., 2005). *Fasciola hepatica* and *Fasciola gigantica* are two main species of *Fasciola*. *F. gigantica* is occurring mainly in tropical and *F. hepatica* in temperate areas, both species overlap in subtropical zones (Mas-Coma *et al*., 2009).

Distribution of *lymnaea* species of snail which act as intermediate hosts for fasciola can aggravate the disease on cattle and sheep where they raised (Biruk, 2019). There are many intermediate hosts for *fasciola* but, most commonly, occurring are *lymnaea trancatula and Lymnaea. natalensis* (Urquhart *et al*., 1996).

Fasciolosis can reduce the productivity of livestock causing huge direct through high mortality and morbidity and it also contributes to the poor productive and reproductive performance of the animals (Shapiro *et al*., 2015; Biruk, 2019) and indirect losses in Ethiopia (Biruk, 2019).

Fasciolosis is denoted as a significant veterinary health problem (Nazima *et al*., 2016) and an obstacle in profitable bovine farming and for butchers and consumers too (Mas-Coma *et al*., 2005). In Ethiopia, there were many research work conducted on abattoir studies of prevalence range from 8.1% in Buno province (Seyoum, 1987) up to 56.4% in Bahir Dar (Gebrie and Wondmnew, 2020) by different researcher which could tell distribution of the disease and right way of fasciolosis controlling measures. However, there is no research work conducted and documented data on disease distribution and its occurrence in the study area. This study aims to fill such gap hence be carried out in cattle in study area. Therefore, the objectives of study was to investigate the prevalence, economic losses, associated risk factors and coprology of bovine fasciolosis in selected district's municipal abattoirs of Wolaita zone. The study may benefit the farmers to deworm their cattle as schedule, it explain extent of diseases occurrence for veterinarians, meat inspectors and animal health workers to design epidemiological study for control approach based on evidence.

Specific objectives of the study are:

- To determine prevalence and commonly observed species of fasciola
- To determine the associated financial losses and risk factors for fasciolosis
- To compare diagnostic efficiency of coprology and postmortem.

2. Material and Methodes

Study Area:

The study area comprised of Gesuba town, Baliko segno and Lasho. Gesuba town is one of the six municipal administrations found in Wolaita zone, South Ethiopia. But, Baliko segno and Lasho are administrative town of Bayira koyisha district and Kawo koyisha district respectively. The approximate distance of study area 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 6°43’27” – 6° 44’ 59.99N 37° 29’ 59.99 - 37°33’24”E. The mean annual rainfall ranging between 900 and 1200mm and average temperature is 14°C-34°C. 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).

Study Population:

The study was conducted 400 adult male and female indigenous cattle present to the abattoir for slaughter from various nearby districts and Kebeles of the study area. All animals were slaughtered in Gesuba municipal abattoir and district municipal abattoirs of Kawo koyisha (Lasho) and Bayira koyisha (Baliko sagno) districts were the population of study.

Sample Size Determination:

The sample size of the study was determined by considering estimated prevalence of 50% since there was no previous abattoir survey conducted in the study area (Thrust field, 2005). The sample size calculated was 384 with 95% confidence interval and 5% expected error.

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

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

Therefore, the study area covered three districts and one town; to increase the precision the sample size increased to 400 samples.

Study Design:

A cross sectional study was carried out from Jaunary, 2022 to May, 2022 by collecting data from cattle slaughtered at Gesuba municipality abattoir and district municipal abattoir of Baklo segno and Lasho. During abattoir study animals were selected for sampling using simple random sampling in which examining of animal carry out following ante-mortem and post mortem inspection procedure by following the recording format while respecting the slaughtering time of the abattoir. During this time, all available information regarding age, sex, body condition, study area and agro ecology were recorded in recording format.

Antimortem examination:

At anti-mortem examination all available information and the way to identify the animal at time of slaughtering were recorded on recording format. The age of each animal was confirmed by looking at the physical appearance of body and examining the dental pad and incisor teeth (Pace and Wake man, 2003). The age of animals were categorized into three age groups as young (<6 years), adult (6–8 years) and old >8 years, based on their dentition (Adane *et al.*, 2019). The Body scoring of the cattle was made based on numbering of its body condition from the number 1(L-, very lean) to 9 (F+, very fat) and these scores finally included under three body condition scores, good, medium and poor (Rasby *et al.,* 2014).

Postmortem examination:

Post-mortem examination of liver and associated bile duct was carefully examined by visualization, palpation and incision of the entire organ (Assefa *et al.*, 2016).

Infection based on causative agent was classified as *F. hepatica*, *F. gigantica and* mixed *Fasciola* species (*F. hepatica* and *F. gigantica*) infection. Fasciola species identification can be performed based on morphological features (including body length, body width and body area) of the parasite (Yatswako and Bida, 2017). Species identification of the recovered *Fasciola* was conducted.

Fecal (Coprological) examination:

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 are greyish in color when stained by methylene blue (Antonia *et al.*, 2002).

Sensitivity and specificity of the fecal examination method:

The comparative diagnosis of fecal and postmortem can evaluate the sensitivity of the direct sedimentation method. The sensitivity and specificity of the method was calculated by taking liver examination at postmortem as gold standard for the diagnosis of fasciolosis.

Sensitivity=a/a+c; specificity=d/b+d

K=observed agreement-chance agreement

1-chance agreements

Observed agreement=a+d/N

Chanceof agreement=(a+c/N*a+b/N)+(b+d/N*c+d/N)

Kappa statistic was used to determine the degree of agreement between the two methods of liver fluke diagnosis. The kappa value was interpreted as: slight agreement ($k < 0.2$); fair agreement ($k = 0.2 - 0.4$); moderate agreement ($k = 0.4 - 0.6$); substantial agreement ($k = 0.6$ to 0.8); and almost perfect agreement ($k > 0.8$) (Thrusfield, 2005).

Economic loss assessment:

To determine the total financial loss due to fasciolosis in cattle slaughter at Gesuba municipal abattoir and districts municipal abattoir were calculated by the summation of annual liver condemnation (direct loss) and due to carcass weight reduction and poor-quality carcass (indirect loss).

Direct economic loss:

All livers affected with fasciolosis were totally condemned. The annual direct financial loss was assessed by considering the overall prevalence rate of the disease, the total annual slaughtered animal in the abattoir and retail price during the time of sample collection of an average animal liver. The information obtain was subjected to mathematical calculation, ALC= CSR*MLC*P Where, ALC = Annual loss from liver condemnation; CSR = Mean annual cattle slaughtered per year at abattoir survey; MLC= Mean cost of one liver at study area, P = Prevalence rate of the fasciolosis at abattoir survey (Ogurinade and Ogurnrinade, 1980).

Indirect economic loss:

The indirect (carcass weight reduction) economic loss due to fasciolosis was calculated by considering an estimated 10% carcass weight loss due to fasciolosis in cattle as reported by Robertson (1976) and average carcass weight of an Ethiopian zebu is taken as 126 kg (ILCA, 1992). The annual economic loss because of carcass weight reduction due to bovine fasciolosis was calculated by the formula: (ACW) = CSR* CL * BC * P*126 kg (Ogunrinade and Ogunrinade, 1980). Where, ACW is annual loss from carcass weight reduction; CSR, average number of cattle slaughtered at abattoir survey per year; CL, carcass weight loss in individual cattle due to fasciolosis; BC, an average price of 1 kg beef at the study abattoir; P, prevalence rate of fasciolosis at the study abattoir; 126 kg, average carcass weight of Ethiopia Zebu cattle.

Data Analysis:

All raw data from the study was coded and entered to directly in to SPSS version-20 computer program; and data then analyzed to find percentage and Chi-squire ($\chi 2$). P-value was determined for determining of the significance. Chi-square test can be used to determine the variation in, existing variable. The total prevalence obtained by calculating and dividing the number of disease positive animals by the total number of animals examined. Statistical significance was set at $p< 0.05$ to determine whether there were significant differences between the parameters measured between the groups. The test of agreement between the liver examination and faecal examinations was also calculated for test of kappa.

3. Results and Discussions

Totally 400 samples of liver and faeces were examined for presence of liver flukes and egg respectively. The results revealed the total prevalence of fasciolosis 14.5% in liver inspection and 8.5% in coproscopy (table 3 and table 4). The postmortem result was less than eight year before up to near time prevalence reported from the different part of Ethiopia. In Bedele Mahendra *et al.* (2015) reported 32.53%, in Areka Moje *et al.* (2015) reported 30% prevalence, in Arba Minch Mandefrot *et al.* (2017) reported 33.83%, in Ambo district Abiy and Dereje (2018) reported 39.15%, in Wulnchit Asefa and Tegegne (2018) reported 34.23%, in Wolaita Soddo Adane *et al.* (2019) reported 20.24% and in Bahir Dar Gebrie and Wondmnew (2020) reported 56.4% prevalence. The difference in the prevalence of bovine fasciolosis in study area might be due to the awareness creation, increased the veterinary health service and increased demand of cultivation land that reduce communual grazing land thereby decrease of swampy and marshy land.

However, the current result higher than the report of Abunna *et al* (2009) 4.9% in Soddo Abattoir, Debela *et al* (2014) 12.5% in Aira and Gulliso District,Western Wollega Zone, Assefa *et al.* (2016)11.72% in Bedele, Ouchene-Khelifi *et al.*

(2018) 2.86% and 1.7% in two regions in Algeria and Ayad *et al.* (2019) 2.83% Bejaia province in Algeria. Difference in prevalence among geographical locations is associated mainly to the difference in the climatic and ecological conditions which include altitude, rainfall and temperature. *Fasciola* prevalence variation time to time associated with the variation in amount and pattern of rainfall (Miheretab *et al.* 2010).

Among the liver infesting fasciola species in study area, *F. hepatica* 48.28%, *F.gigantica* 27.58% and mixed infestation 24.14% were recorded (table 1). The current report was similar to the report of Abebe *et al.* (2010) from Hawassa, Mulugeta *et al.* (2011) from in and Around Assela, Belay *et al.* (2012) from Dessie, Chakiso, *et al.* (2014) from Lemo District and Hossana, Alemu and Abebe (2015) from Wolaita Soddo, Ibrahim *et al.* (2016) from Haramaya, Asefa and Tegegne (2018) from Wulnchit, and Teketel (2019) from Jimma. The high prevalence rate of *F.hepatica* might be due to associated with the existence of favorable ecological biotope for *L. truncatula*. In current study area, there are so many water lodges and spring water and ponds which favor the multiplication of intermediate host *L.truncatula.* Similarily, the distribution of fasciolosis is worldwide, however, the distribution of *F. hepatica,* is highlands of tropical and subtropical regions (Soulsby, 1982) and *L. trancatula* is an amphibious snail living in shadow ponds, wet lands and water troughs (Urquhart *et al.*,1996).

However, inverse distribution was reported by Mage *et al.* (2002) from central France, Phiri *et al.* (2005) from Zambia, Abunna *et al.* (2009) from Wolaita Soddo and Mwabonimana *et al.* (2009) from Tanzania. *F. gigantica* found in Africa and is widely distributed in tropical and subtropical areas. This might be due to the availability of appropriate environmental conditions and topography (lowland and middle altitude zone) which are favorable habitat to its intermediate host *L. natalensis.*

Mixed infection was observed in current study area. This result in line with the report of Mas-coma *et al.* (2009) who reported *F. hepatica* and *F. gigantica* coexists in Africa in areas of Nile drainage, great lakes mountain ranges and Rift Valley arms because such areas have alternating altitudes and climatic conditions favouring the survival of respective snail vectors. Similarily, mixed infection of *F. hepatica* and *F. gigantica* occurs presumably as a result of the movement of stock between high and low ground or through overlapping of the territories of the snail vector at altitudinal range of 1200-1800 M.a.s.l (Kendel 1954 and Graber, 1975).

Table (1): Species of Fasciola with respect to study area

Study area	*F. hepat*	*F. gig*	Mixed-infec	Total posit	-ve	total	X^2	P-value
Gesuba	14	5	6	25	207	234	17.764	0.007
Baliko sagno	3	6	4	13	81	94		
Lasho	11	5	4	20	52	72		
Total	**28**	**16**	**14**	**58**	**340**	**400**		

On current study the overall prevalence of bovine fasciolosis recorded 14.5% which end up with total financial losses Table (2) of 5,614,657.68ETB/ 80, 209.40USD. This finding was higher than the report of Petros *et al.* (2013) 63072 ETB in Nekemte, Mahendra *et al.* (2015) 228,360.6 ETB (13,591 USD) in Bedele, Moje *et al.* (2015) 47,124 ETB (2406.74USD) in Areka, Ibrahim *et al.* (2016) 86, 083.2 (4414.523 USD) in Haramaya, Mandifrot *et al.* (2017) 726,561.5 ETB ($ 52,649.38) in Arba Minch, Ayele *et al.* (2018) 52,981ETB (2649USD) in and around Debire Birhan and Opio *et al.* (2021) 10,306.66 USD in Uganda. The variations obtained might be due to the differences in agro-ecology, number of animals sampled, scarcity and availability of grazing land, duration of study, the area determined price of beef and liver, and increased or decreased demand on liver and dollar exchange price.

Table (2): Financial losses due to liver condemnations of the study area

Study area	+ve	Jugt	P%	ASC	ALP	ABP	DEL/ETB	IDEL/ETB	TL	GTEL
Gesuba	25	T C	10.68	2180	1400	600	325,953.6	1,760,149.44	2,086,103.04	5,614,657.68ETB/ 80,209.40USD
Baliko sagno	13	TC	13.83	1300	1000	560	179,790	1,268,598.24	1,448,388.24	
Lasho	20	TC	27.78	1040	900	500	260,020	1,820,145.6	2,080,166.4	

Note :TC= Totally condemned, +ve liver= numbers of positive liver, judgt= judgement, P%= prevalence, ASC=Average numbers of cattle slaughtered per year, ALP=Average price of a liver, ABP=Average price of 1kg of beef, DEL/ETB=Direct Economic losses (ETB)ALC= CSR*MLC*P, IDEL/ETB=Indirect financial losses (ETB) ACW = CSR* CL * BC * P*126 kg, Tl=Total financial losses ETB/USD and GTEL=Grand total of financial lossesETB/USD

Note: Average carcass weight of zebu (126kg).

Table (3): Prevalence of fasciolosis in bovine on postmortem examination and associated risk factors at abattoir survey of study area

Risk factors		positive	Total sample	P %	X2	P -value
Agroecology	Lowland	25	234	10.68	15.232	0.000
	Midland	13	94	13.83		
	Highland	20	72	27.78		
Sex	Female	22	230	9.57	10.630	0.001
	Male	36	170	21.17		
Age	Young(<6year)	5	58	8.62	2.225	0.329
	Adult (6-8year)	20	141	14.18		
	Old (>8year)	33	201	16.42		
Body condition	Poor	16	74	26.62	8.240	0.016
	Medium	25	142	17.6		
	Good	17	184	9.24		

Prevalence of fasciolosis in cattle on liver inspection with respect to abattoirs of study area revealed Gesuba town (lowland) 10.68%, Baliko sagno (midland) 13.83% and Lasho (highland) 27.78% Table (3). The highest prevalence was recorded in highland. This might be due to persistence of marshy areas for long periods up to the dry season, conduciveness condition of area for snail and presence of ponds which create a very favorable environment for both the snails' intermediate host and the parasites (*Fasciola*). Moreover, prevalence of fasciolosis on the basis of site may be explained by the fact that the animal slaughtered at the study area of abattoir came from the areas which had different ecological and climatic conditions. Since Ethiopia's topography is mountainous with many ups and downs, difference in the occurrence of the disease might be the result of agro-ecological comfort ability for both the parasite and the snail (Mahendra *et al.*, 2015).

In this study, prevalence of fasciolosis in bovine of different sex's, male and females showed ($p<0.05$) (table 3). This might be explained by the fact that in the study area the topographical uncomfortability for ploughing of land gives low attention for adult male animals that enforce animal to feed on communal land which contains swamy and marshy land. Area containing marshy and swampy land is favorable for intermediate host and animal easily harbor parasite from field. But, female animal get high care from owner by tethering around the homes or managed intensively to get new calf and milk for home consumption there by access of infection will be lower compared to males because expose to communal land is very low. Similar finding was reported as the disparity in susceptibility between sexes could be attributed to intrinsic factors such as genetics, physiology and immunology and extrinsic factors such as environment and management practices (Magaji *et al.*, 2014).

The prevalence of cattle fasciolosis observed in young (<6 year) 8.6%, adult (6-8 year) 14.18% and old (>8 year) 16.42%) which was ($P=0.329$) (table 3). This indicates the age has no effect on occurrence of disease in animals of different age groups. This might be due to cattle in the study area graze in the same communal grazing land without discriminating animal with age group which enhance all age group to be equal chance of harboring parasite from field. This justification close with the stating of Ibrahim *et al.* (2014) who explained cattle in the study area graze in the same communal grazing land with similar agroecological condition so that the chance of infections therefore similar and early release of young stock with adult.

Prevalence of fasciolosis based on body condition in poor body condition, medium body condition and good body conditions recorded 21.62%, 17.6% and 9.24% respectively Table (3). The prevalence was higher in poor body conditioned cattle indicating body condition was directly related to infestation rate. This might be due to the feeding habit of parasite depends on blood meal which could cause losses of body weight, predispose to other diseases and decreases immune system of animal.

Table (4): Specificity, Sensitivity of comparative diagnosis of coprology and postmortem

Parameter	Postmortem posetive	Postmortem negative	Total	Calculated Kappa value	P-value
Copro- posetive	34(a)	0(b)	34(a+b)	0.71	0.000
Copro-negative	24(c)	342(d)	366(c+d)		
Total	**58(a+c)**	**342(b+d)**	**n=400**		

The lower prevalence of fasciolosis using coproscopy 8.5% than abattoir 14.5% indicated lower sensitivity of this procedure in detecting the disease. The calculated value of sensitivity and the specificity of faecal examination were found to be 58.6% and 100% respectively (table 4). This test suggests that about 42% infected animals may pass undetected. A period of fasciola eggs needed to be appeared in faeces is 8-15 weeks and most pathological lesion presented early at time of parasite migration (SanchezAndrade *et al.*, 2002; Abebe *et al.*, 2010; Mahendra *et al.*, 2015). The current report was lower to the reports of Rapsch *et al* (2006) 69% in Switzerland, Abebe *et al.* (2010) 67.1% in Southern Ethiopia and Assefa *et al.* (2016) 71.1% in Bedele. However, it is higher than the sensitivity reported by Abunna (2010) 35% in Wolaita Sodo and Moje *et al.* (2015) 55.8% in Areka. This might be due to time of sample collection and preservation procedure, labeling of sample container, and starting of pathological lesions before appearing of fasciola eggs (8-15 weeks).

The calculated kappa value (kappa=0.71) revealed the presence of substantial agreements between the two techniques.

4. Conclusion and Recommendations

The present study revealed prevalence of the bovine fasciolosis in study area was very low when compared to current time research work of others throughout the country and it might be due to study conducted from January to May. These months almost dry and the fluctuation of rain and over sun light may affect the snail breeding and fasciola life cycle in the area. Bovine fasciolosis is caused by *F. hepatica* and *F. gigantica* which are widely distributed in different agro-ecology of the study area. F. hepatica is the most prevalent fluke species and followed by F. gigantica and mixed infection in current study area. The observed prevalence level in this study suggests the existence of intermediate host and climatic conditions which favors development and survival of the parasite in the area of origin of the study animals. However, the prevalence is low, still there is high economic loss incurred due to considerable loss of revenue due to condemnation of affected liver and carcass weight reduction at study municipality abattoir which reflects it needs strict control measures on the snail and parasites. The sensitivity of coprology was lower than post mortem. In study area the occurrence of fasciolosis related with different risk factors such as agro ecology, sex and body condition and they are statistically significant. But, the risk factors like age has no effect on occurrence of fasciolosis. Based on the conclusions the following recommendations are forwarded:

- Since fasciolosis is zoonotic diseases and it can affect both human and animals, which has high economic impact. So Wolaita zone government, veterinarians, animal health extension staff, laboratory technicians and meat inspectors should contribute their respective effort in controlling the transmission and distribution of the diseases.
- The epidemiology of fasciolosis and ecology of intermediate host (snails) detailed studies should be conducted.

- To save the financial losses due to liver condemnation and carcass weight loss, ignoring of pass of poor body condition animal and other parasitological techniques with high sensitivity and specific diagnostic techniques should be applied at ant mortem examination is justifiable.
- 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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References:

Abebe R., F., et al. (2010). Fasciolosis: Prevalence, financial losses due to liver condemnation and evaluation of a simple sedimentation diagnostic technique in cattle slaughtered at Hawassa Municipal abattoir, southern Ethiopia. *Ethio. Vet. J.* 14 (1), 39-51.

Abiy, G. & Dereje, T. (2018). Study of Prevalence and Associated Risk Factorsof Bovine Fasciolosis in and Around Ambo District: Abattoir and Field Survey Western Ethiopia. *Biomed J Sci & Tech Res.***11**(3), 8515-8520. https://doi.org/10.26717/bjstr.2018.11.002100

Abunna F., Asfaw, L. Megarsa, B. & Regassa, A. (2010). Bovine fasciolosis: coprological, abattoir survey and its economic impact due to liver condemnation at Soddo municipal abattoir, Southern Ethiopia. *Trop. Anim. Hlth. and Prod.* 42(2), 289-292. https://doi.org/10.1007/s11250-009-9419-3

Adane Z., Yehualashet B. & Anteneh W. (2019). Prevalence of Bovine Fasciolosis and Its Economic Loss due toLiver Condemnation at Wolaita Sodo Municipal Abattair, Ethiopia.*Vet. Med. Intern. Res. Article.* 2019, 1-7.

Alemu, A. & Abebe, B. (2015). Fasciolosis: Prevalence, Evaluation of Floatation and Simple Sedimentation Diagnostic Techniques and Monetary Loss due to Liver Condemnation in Cattle Slaughtered at Wolaita Soddo Municipal Abattoir, Southern Ethiopia. *Food Science and Quality Management*, 43.

Antonia M., et al. (2002). evaluation of a Simple Sedimentation Method (modified MacMaster) for diagnosis of bovine fasciolosis. *Vet Parasitol* 105(4), 337-343. https://doi.org/10.1016/s0304-4017(02)00016-x

Asefa, G. & Tegegne, B. (2018). Prevalence of Bovine Fasciolosis and Economic Importance in Wulnchit Municipal Abattoir, Ethiopia. *Global Journal of Science Frontier Research: C Biological Science.* 18(3), 17-23.

Assefa K., Danboba, T. & Etsegenet, T. (2016). Comparison on Sensitivity of Coprological and Post Mortem Examination in Diagnosis of Bovine Fasciolosis: Prevalence of the Disease in Bedele Municipal Abattoir. *African J. Basic & Appl. Sci.*, **8** (1), 63-72.

Ayad A., et al. (2019). A retrospective survey of fasciolosis and hydatidosis in domestic ruminants based on abattoirs' data in Bejaia province, Algeria. *Veterinaria*, 68, 47–51.

Ayele, Y, wondmnew, F. & Yeshiwas, T. (2018). The Prevalence of Bovine and Ovine Fasciolosis and the Associated Economic Loss Due to Liver Condemnation in and around Debire Birhan, Ethiopia. *SOJ Immunol*, **6**(3), 1-11. https://doi.org/10.15226/2372-0948/6/3/00177

Belay, E., Molla, W. & Amare, A. (2012). Prevalence and Economic Losses of Bovine Fasciolosis in Dessie Municipal Abattoir, South Wollo Zone, Ethiopia. *European Journal of Biological Sciences*, 4 (2), 53-59.

Biruk, A. (2019). Bovine Fasciolosis in Ethiopia-A review. *J Vet Ani Res***2**, (202),1-12.

Chakiso B.; Menkir, S. & Desta, M. (2014). On Farm Study of Bovine Fasciolosis in Lemo District and its economic loss due to liver condemnation at Hossana Municipal abattoir, Southern Ethiopia. *Int.J. Curr.Microbiol.App.Sci*, 3(4), 1122-1132.

CSA. (2020). *Agricultural sample survey* Vol. 2 report on livestock and livestock characteristics (private peasant holdings) statistical bulletin 587.

Debela, A., Tadesse, B., Mezene W. & Chali, D. (2014). Study on the Prevalence of Bovine Fasciolosis at Aira and Gulliso District, Western Wollega Zone, Oromia Regional State, Western Ethiopia. *Afr J Basic Appl Sci* 6, 37-42.

Gebrie, Y. & Wondmnew, T. (2020). Prevalence Bovine Fasciolosis in Postmortem Examination at Bahir Dar Municipal Abattoir, Bahir Dar, Ethiopia. *J. Ani Husb and Dairy Sci* **4** (2), 30-36.

Graber, M. (1975). Helminthes and Helminthiasis of Domestic and Wild Animals of Ethiopia. *Bulletin of Animal Health and Production in Africa*, 23, 570-86.

Hansen, J. & Perry, B. (1994). *The epidemiology, diagnosis and control of helminth parasites of ruminants*. The International Laboratory for Research on Animal Diseases, Nairobi, Kenya.Pp1-129.

Ibrahim, N., Mohammed, Y., Wubit, T. & Yosef, D. (2016). Prevalence of Bovine Fasciolosis in Municipal Abattoir of Haramaya, Ethiopia. *Food Science and Quality Management*, 48, 38-43.

ILCA, International Livestock Center for Africa (1992). *annual report and program high lands*.

Kendall, S.B. (1954). Fascioliasis in Pakistan. *Ann. Trop. Med. Parasitol*., 48(3), 307-313. https://doi.org/10.1080/00034983.1954.11685628

Magaji, A.A., et al. (2014). Prevalence of Fasciolosis in Cattle Slaughtered in Sokoto Metropolitan Abattoir, Sokoto, Nigeria. *Adv. Epidemiol.*, 2014, 1–5.

Mage, C., et al. (2002). Fasciola hepatica and Paramphistomum daubneyi: changes in prevalences of natural infections in cattle and in Lymnaea truncatula from central France over the past 12 years. *Vet. Res.* 33(5), 439-447. https://doi.org/10.1051/vetres:2002030

Mahendra, P., Yitagezu, A. & Tefera, W. (2015). Prevalence of bovine Fasciolosis and Its Economic Impact in Bedele, Ethiopia. *Research Article Haryana Vet.***54** (1), 7-10.

Mandefrot, M., Abayneh, K., Biresaw, S. & Mishamo, S. (2017). Prevalence, gross pathological lesions and financiallosses of bovine Fasciolosis in Arba Minch Municipal Abattoir, Gamo Gofa Zone, Southern Ethiopia. *J. Vet. Med. Ani. Health.* 9(8), 186-192. https://doi.org/10.5897/jvmah2016.0523

Mas Coma, S., Bargues, M.D. & Valero, M.A. (2005). Fascioliasis and other plant-borne trematode zoonoses. *Int. J. Parasitol.* **35 (11-12)**,1255–1278. https://doi.org/10.1016/j.ijpara.2005.07.010

Mas-Coma, S., Valero, M.A. & Bargues, M.D. (2009). Fasciola, lymnaeids and human fascioliasis, with a global overview on disease transmission, epidemiology, evolutionary genetics, molecular epidemiology and control. *Adv. Parasitol*. 69, 41 –146. https://doi.org/10.1016/s0065-308x(09)69002-3

ME. (2021). *Ethiopia's Livestock Systems: Overview and Areas of Inquiry*. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. Pp 1-48.

Mekky M.A., et al. (2015). Human fascioliasis: a re-emerging disease in Upper Egypt. *The American journal of tropical medicine and hygiene*, 93(1), 76-79. https://doi.org/10.4269/ajtmh.15-0030

Miheretab, B., Tesfay, H. & Getachew, Y. (2010). Bovine Fasciolosis: Prevalence and its economic loss due to liver condemnation at Adwa Municipal Abattoir, North Ethiopia. *E.J.A.S.T*, 1, 39-47.

MOA (2013). *Major challenges and achievements in Ethiopian livestock production. Ministry of Agriculture, January 2013. Presentation*. Ministry of Agriculture (MOA): Addis Ababa, Ethiopia.

Moje, N., Mathewos, S., Desissa, F. & Regassa, A. (2015). Cross-sectional study on bovine fasciolosis: prevalence, coprological, abattoir survey and financial loss due to liver condemnation at Areka Municipal Abattoir, Southern Ethiopia. *J.Vet.Med. Anim. Health.*7(1), 33-38. https://doi.org/10.5897/jvmah2014.0342

Mulugeta, S., Begna, F. & Tsegaye, E. (2011). Prevalence of Bovine Fasciolosis and its Economic Significane in and Around Assela, Ethiopia. *Global Journal of Medical research*, 11(3).

Musotsi, P.Y., Otieno, C.A. & Njoroge, S. M. (2017). Prevalence of Fasciolosis in Cattle, Sheep, and Goats Slaughtered in Slaughter Slabs in Trans-Nzoia West, Kenya. and Knowledge of Livestock Handlers. *J. Bio Agri. and Healthcare.* **7**(6), 34-43.

Mwabonimana MF. et al. (2009). Prevalence and economic significance of bovine fasciolosis in slaughtered cattle at Arusha abattoir, Tanzania. *Tanz Vet.J.* 26, 68–74. https://doi.org/10.4314/tvj.v26i2.53804

Nazima G., et al. (2016). Prevalence of Fasciola Infection in Slaughtered Animals in Kashmir. *Glo J. Med Res: G Vet. Sci. Vet. Med.* 16(3), 1-11.

Ogunrinade, A. & Ogunrinade, B. (1980). Economic importance bovine fasciolosis in Nigeria.*Trop. Anim. Health Prod*. **12**(3), 155-1590.

Opio L.G., et al. (2021). Prevalence of Fascioliasis and Associated Economic Losses in Cattle Slaughtered at Lira Municipality Abattoir in Northern Uganda. *Animals*, 11(3), 681. https://doi.org/10.3390/ani11030681

Ouchene-Khelifi, N.A., et al. (2018). Fasciolosis due to Fasciola hepatica in ruminants in abattoirs and its economic impact in two regions in Algeria, *Tropical Biomedicine*, 35, 181–187

Pace, J. E. & Wake man, D. L. (2003). *Determining the age of cattle by their teeth.Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences*. University of Florida, Gaines ville, Flourida

Phiri, A.M., Phiri, I.K., Sikasunge, C.S. & Monrad J. (2005). Prevalence of fasciolosis in Zambian cattle observed at selected abattoirs with emphasis on age, sex and origin. *J. vet. Med. series.* 52(9), 414-416. https://doi.org/10.1111/j.1439-0450.2005.00872.x

Rapsch C., et al. (2006). Estimating the true prevalence of Fasciola hepatica in cattle slaughtered in Switzerland in the absence of an absolute diagnostic test. *Int. J.Par.* 36 (10-11), 1153-1158. https://doi.org/10.1016/j.ijpara.2006.06.001

Rasby R.J., et al. (2014). Body Condition Scoring Beef Cow: a tool for managing the nutrition program for beef herds. University of Nebraska Cooperative Extension.

Rege, J. E. O. & Lebbie, S. H. B. (2000). *The goat resources of Africa: origin, distribution and contribution to the national economies. In: Seventh international conference on goats*. Tours, France, pp. 927-931

Robertson, A (1976). *Handbook on animal disease in tropics*. pp: 3:304.

Sanchez-Andrade, R., et al. (2002). Influence of Age and Breed on Natural Bovine Fasciolosis in an Endemic area (Galicia, NW Spain). *Vet. Res. Commun*. 26, 361-370.

Seyoum, S (1987). *Incidence of Bovine fasciolosis on Buno province*.

Shapiro, B.I., et al. (2015). *Ethiopia Livestock Master Plan.ILRI Project Report.* International Livestock Research Institute (ILRI), 127.

Soulsby, E.J.L. (1982). *Helminthes, Arthropod and protozoa of Domestic Animals, 7 ed*. Baillere Tindall, London, UK, pp: 40-52

Tegegne, A. & Feye, G. L. (2020). *Study of selected livestock innovations in Ethiopia*. ZEF Working Paper 192, Christian Borgemeister, University of Bonn. pp 1-42.

Teketel, E. (2019). Prevalence of Bovine Fasciolosis and Associated Financial Loss due to Liver Condemnation at Jimma Municipal Abattoir, Jimma, Ethiopia. *Int. J. Adv. Res. Biol. Sci.* 6(7), 132-139.

Thrusfield, M. (2005). *Veterinary epidemiology, 6th ed*. Blackwell publishing, London, Pp. 233.

Umer, S. & Mulugeta, M. (2018). Review on Prevalence, Distribution and Economic Significance of Liver Fluke in Ethiopia. *ARC J. Ani. Veter. Sci*. 4 (2), 38-48. https://doi.org/10.20431/2455-2518.0402006

Urquhart G. M., et al. (1996). Vet. *Parasit. Second Edition*. Blacwell Scince, UK. Pp. 103-113.

World Bank (2017). International Development Association: Project Appraisal Document on a Proposed Credit in the Amount of SDR 121.1 Million (US$ 170 Million Equivalent) to the Federal Democratic Republic of Ethiopia for a Livestock and Fisheries Sector Development Project (Project Appraisal Document No. PAD2396). Washington DC.

Wolaita Zone agricultural development department (2022).

Yatswako, S & Bida, N. (2017). Survey of bovine fasciolosis burdens in trade cattle slaughtered at abattoirs in north-Central Nigeria: the associated predisposing factors and economic implication. *Parasite Epidemiol Control*. 2(2), 30– 39. https://doi.org/10.1016/j.parepi.2017.02.001