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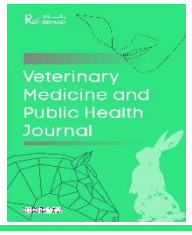

Study on Coprological and Postmortem Investigation of Bovine Fasciolosis at Sebeta Municipal Slaughterhouse, Special Zone of Oromia, Oromia, Ethiopia

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Abstract

Fasciolosis is a parasitic plant-born trematodes worm infection caused by the common liver fluke Fasciola hepatica as well as by Fasciola gigantica. The aim of this study was to analyze the bovine fasciolosis and afford various figures about epidemiology, management and control of the disease. A cross-sectional study was accompanied to regulate the prevalence of bovine fasciolosis and ascertain its related risk issues by both coprological and postmortem examination of liver at Sebeta municipal abattoir from November, 2017 to March, 2018. The method includes learning area, study population, study design, sample size and sampling, sampling measures, data managing and investigation. Fasciolosis is a disease causing mortality and production losses mainly in ruminants. Coprological and post-mortem analyses were performed on total of 384 cattle slaughtered in Sebeta municipal abattior. Sex, age, breed, body condition score and origin of animals were taken into attention as risk factors. Fecal examination, followed by liver incision, surveillance and species ID on the basis of size and morphology of adult worm were functional. An outside total prevalence of 18.5% (71) and 22.4% (86) were found on the basis of coprological and post-mortem examinations, respectively. The percentage agreement between the two diagnostic methods was 82.56%. However, post-mortem examination of infected livers was better for diagnosis of fasciolosis in slaughtered animals as early infection can also be diagnosed. Among the possible risk factors associated with fasciolosis, only sex and origin of the animals did not show significant variation ($p > 0.05$). However, age, body condition and breed of the cattle was important ($\chi 2 = 5.666a$ $p=.017$, $\chi 2=98.603a$ $p=.000$ $\chi 2=8.891a$ $p=.003$) respectively, which show significant variation between them. From the finding, the dominant species in the revision area was *F. hepatica* (44.2%), while *F. gigantica* and mixed infection were recorded in 36.0% and 18.8%, respectively. The study specifies that the infection occurrence of fasciolosis was based on body condition of animals, age and breed of animals, but origin and sex of animals have little importance on prevalence of fasciolosis. Appropriate ante mortem, postmortem assessment and snail control methods are recommended for control measures.

Keyword: *Prevalence; Fasciola gigantica; Fasciola hepatica; postmortem examination.*

1. Introduction

Bovine fasciolosis is economically main parasitic diseases of livestock initiated by digenaen trematodes of genus Fasciola generally well- known as liver fluke.

The genus Fasciola is of main significance to tame animals, principally ruminants, which infects two species, *Fasciola hepatica*, the public temperate liver fluke, and *Fasciola gigantica*, the tropical huge liver fluke (BMC Veterinary Research, 2019).

Fasciola hepatica, the communal liver fluke, sources consequences from the haematophagic activities which principal to secondary bacterial contamination such as bacillary red water in cattle which was produced by members of the genus Clostridium, anaerobic spore forming bacteria (Lalor et al. 2021).

It passes its life cycle in two diverse hosts: those are intermediate and definite hosts. Definitive hosts comprise cattle, sheep, many other ruminants, equidae, swine and rabbits. L. truncatula and L. natalensis in particular are the two furthermost public intermediate hosts for F. hepatica and F. gigantica correspondingly. These intermediate hosts aid as sources of communication to animals that the animal increase entrees their infective stage via food and liquid (Zewde. A et al. 2019).

Pathogenesis of fasciolosis differs along with the parasitic growth phases: parenchymal and biliary phases. The parenchymal phase happens while the flukes travel via the liver parenchyma and related to liver injury and depletion. The biliary phase agrees using parasite dwelling in the bile ducts and affects after the haematophagic action of the adult flukes and from the destruction to the bile duct mucosa by their cuticular spines (Lalor et al. 2021).

The most common form of the disease in cattle is chronic fasciolosis which arises once the parasite touches the hepatic bile duct (Wagari, 2021). The animal comes to be wasted, ensures pale eyes and gums and usually advances "bottle jaw" due to edema below the jaw (Tasmanian livestock health report, 2023). Diagnosis of fasciolosis is established on clinical sign, browsing history and periodic manifestation, investigation of feces by laboratory tests and post mortem analysis (Wagari, 2021).

Medicines are unlike in their effectiveness, method of action and cost. Numbers of treatments have been recycled to regulate fasciolosis in animals. Triclabendazole is the cure of best due to its effectiveness meant for equally the larval, adult flukes and the focal regulator actions decrease snail population, use of antihelmintics, vaccination and protection. Management of fasciolosis might come close to by falling population of the intermediate snail host and anthelmintics (Tasmanian livestock health report, 2023).

The financial harms due to fasciolosis all over the biosphere are massive, and these damages are associated with death, morbidity, reduced growth rate, disapproval of liver, enlarged susceptibility to secondary infections and expenditure due to controller methods Ethiopia has as considerable livestock properties; its level of output is low due to limitations of disease. Out of these diseases is fasciolosis which is one of the momentous infections of nature (Wagari, 2021).

Consequently, the purposes of this assessment newspaper were:

- To analysis about bovine fasciolosis
- To afford various figures about epidemiology, management and control of the disease.

2. Materials and Methods

2.1. Learning Area

The revision was accompanied in Sebeta publi c abattoir which was located in southwestern of Ethiopia.

Sebeta is located at 25 km Southwest of Addis Ababa in Oromia regional state. Special zone of Oromia is surrounding Finfinne and geographically is located 8°55-8.917°N and 38°37-38.617°E of latitude and longitude, respectively. The height above sea level of the area varies from 1800 to 3385 meters beyond sea level and the yearly rain fall ranges from 860 to 1200 ml with bimodal distribution. The main raining period extends from June to September and funds 84% of the whole yearly rain fall and a little rainy season from March to May while dry period lasts from October to February. The mean yearly minimum and maximum temperature is 11.3°c and 28°c respectively and relative humidity is 49.3%. Agronomy is the source of revenue for more than 90% of the residents in rural farming communal around Sebeta district. The core agricultural method in the Sebeta zone is diversified crop livestock fabrication, and animals are mainly manufactured in an extensive system (Shibru et al., 2019).

2.2. The study population

Post-mortem inspection and sample gathering was directed on cattle slaughtered at Sebeta municipal slaughterhouse from December 2017 to March 2018. Livestock slaughtered in the abattoir were transported from diverse positions. Coprological investigation was carried out on fecal

examples directly from the rectum of animate animals into a general bottle and then conveyed to the laboratory for the occurrence of distinctive Fasciola eggs via direct sedimentation (Singh, 2021).

2.3. Study Design

A cross-sectional revision was conducted from December 2017 - March 2018 on bovine at Sebeta community abattoir to determine the occ urrence of bovine fasciolosis through with both aut opsy inspection of liver from each slaughtered animal and via laboratory investigation using sedimentation method on feces composed directly from the rectum of animate cattle (Gemede & Legesa, 2023).

2.4. Sample Size and Sampling Method

Slaughterhouse sample was done on cattle slaughtered at Sebeta municipal slaughterhouse through the study age. Probably, altogether cattle slaughtered were tested for the existence of fasciolosis. In instance of animate animal sampling, the animals were nominated via simple random sampling technique where it was scheduled to contain specific 384 cattle. The formula set was by Thrusfield (2005) which is to help decide the quantity of cattle for the test group as follows (McCombes, 2023):

$$n = \frac{(1.96)2\ Pxep\ (1\text{-}Pxep)}{d\ 2}$$

Wherever, n= requisite sample magnitude
1.96 = the value of z at 95% confidence interval
Pexp= expected prevalence and d= desired absolute precision
N= Sample size by taking P=50% and d=0.5%, n= 1.962 0.5(1-0.5) / (0.0025)
n=384 animate animal were tested

2.5. Sampling measures

2.5.1. Post mortem inspection

The liver of all slaughtered animals was cautiously inspected by imagining and palpation of the whole organ that was monitored by transverse incision of the structure to check for the manifestation of adult flukes. Accessible adult flukes were composed in a universal flask encompassing 10% formalin and then transferred to the laboratory for species identification (Gemede & Legesa, 2023).

2.5.2. Coprological examination

Animate animal investigation was accompanied on fecal samples collected right from the rectum of cattle into a universal bottle covering 10% formalin and conveyed to the laboratory for analysis. Sampling was approved out at chance with addition of age, sex, breed, and body situation of animals. The fecal samples were kept at 4 0c until all are managed and inspected. Sedimentation practice was used to notice the occurrence or nonappearance of fluke eggs in the fecal sample collected (Gemede & Legesa, 2023).

2.6 Data managing and investigation

All raw data generated from post-mortem analysis and laboratory results were going into Microsoft Excel computer program. By Statistical Package for Social Science (SPSS) version 20 Computer database, data were examined. The frequency of fasciolosis was calculated as the numbers of diseased individuals divided by the sum of cattle observed x 100. Categorical data were studied with the Pearson's Chi-square (x2) assessment to measure the connotation between prevalence of the parasite with the possible risk factors as a statistical tool. For all analysis, $P < 0.05$ was considered as major variances between the factors measured (Gemede & Legesa, 2023).

3. Results

3.1. Post-Mortem Results

Prevalence: Out of the whole 384 adult native cattle slaughtered and studied in the period from November 2017-March 2018 at Sebeta municipality slaughterhouse, 56(14.6%) were established to be positive for fasciolosis. The body condition marks specify that there was reliable important difference ($p<0.05$) perceived among animals owing good and poor body condition with respect to happening of infection Table (1). Major alteration was witnessed in the prevalence of fasciolosis between diverse age clusters, body condition and breed of animals ($P<0.05$).

Table (1): Major modification observed in the prevalence of fasciolosis within different dynamic groups of animals different dynamic groups of animal.

Category	variable	Animal examined	No Positive	PrevalenceCI	CI	X2
Sex	Male	358	52	14.53%	11.04-18.61	2.790[a]
	Female	26	4	15.4%	4.36-34.87	
	Total	384	56	14.6%	11.21-18.52	
Age	Adult	363	49	13.5%	10.16-17.45	6.27[a] 6.270[a]
	Young	21	7	33.3%	14.59-56.97	
	Total	384	56	14.6%	11.21-18.52	
Body condition	Good	218	29	13.3%		
	Poor	65	18	27.7%	9.10-18.54 17.31-40.19	11.863[a]
	Medium	101	9	8.9%	4.16-16.24	
	Total	384	56	14.6%	11.21-18.52	
Breed	Local	349	45	12.9%	9.56-16.87	8.773[a]
	Cross	35	11	31.4%	16.85-49.29	
	Total	384	56	14.6%	11.21-18.52	

Species arrangement of Fasciola

56 obtained livers were positive for Fasciola contamination through post-mortem of slaughtered cattle, 27 (48.2%) livers harboured *F. hepatica*, 19 (33.9%) livers infested with *F. gigantica* and 10 (17.9%) liver sheltered mixed contagions with together F. hepatica and *F. gigantica* species Table (2).

Table (2): Species conformation of Fasciola distinguished in livers of diseased cattle Slaughtered at Sebeta municipality slaughterhouse.

Species of Fasciola	Total of liver infested	Proportion
F.Hepatica	27	48.2%
F.Gigantica	19	33.9%
Mixed infection	10	17.9%
Total	**56**	**100%**

3.2. Coprological Results

Of the entire 384 fecal samples surveyed from alive cattle, 71 (18.5%) were encouraging for *Fasciola* eggs. There was no precisely major difference in the occurrence of bovine fasciolosis (P<0.05) between the diverse sex collections considered. The prevalence of fasciolosis has no effect between males and females Table (3). There were accurately momentous transformations concerning the age groups of cattle on the incidence of fasciolosis on fecal investigation marks. Significance of fasciolosis based on sex has major ones (P<0.05) Table (4). There was statistically trivial distinction in the prevalence of bovine fasciolosis (P<0.05) amongst the unlike body condition groups studied. There are significant variations among body condition Table (5).

There were scientifically important dissimilarities concerning the local and cross breeds of cattle on the predominance of fasciolosis on fecal inspection outcomes (P<0.05) breed of animals show major fasciolosis among them Table (6).

Table (3): Occurrence of fasciolosis in animate cattle centered on sex source.

Sex	Animal Examined	Positive	Prevalence	95% CI	X2
Male	358	63	17.6%	13.6-13.8	2.790[a]
Female	26	8	30.8%	14.33-51.79	
Total	**384**	**71**	**18.5%**	**14.73-22.74**	

Table (4): Occurrence of fasciolosis in animate cattle centered on age source

Age	Animal examined	Positive	Prevalence	95% CI	X2
Adult	363	63	17.4%	13.6-21.65	5.666[a]
Young	21	8	38.1%	18.11-61.56	
Total	**384**	**71**	**18.5%**	**14.73-22.74**	

*=Significant (P<0.05)

Table (5): Occurrence of fasciolosis in animate cattle centered on body situation.

Body condition	Animal examined	Positive	Prevalence	95% CI	X2
Good	218	11	5.0%	2.55-8.85	100.815[a]
Poor	65	39	60.0%	47.1-71.96	
Medium	101	21	20.8%	13.36-30	
Total	**384**	**71**	**18.5%**	**14.73-22.74**	

*=Significant (P<0.05)

Table (6): Commonness of fasciolosis in living cattle centered on breed of animal.

Breed	Animal examined	Positive	Prevalence	95% CI	X2
Indigenous	349	58	16.6%	12.87-20.95	8.891[a]
Cross	35	13	37.1%	21.47-55.08	
Total	384	71	18.5%	14.73-22.74	

*=Significant (P<0.05)

3.3. Comparison between Antemortem and Postmortem Examination Result

During this study, the feeling and specificity of the straight sedimentation practice were matched with precise outcomes from PM inspection Table (8). The understanding and specificity of the shortest sedimentation system were designed from the marks in table 8 which sets out the numbers of positive and negative checks in animals through and devoid of flukes in their livers (Harun, et al, 2015). Out of the 384 cattle exposed to both fecal and liver inspection, 86 consumed flukes in their livers, but only 71 displayed Fasciola eggs in their feces. Consequently, the understanding of a single investigation by sedimentation way was established to be 82.56%, and specificity was 100%.

Table (8): The attendance or nonattendance of Fasciola spp. eggs in the feces of cattle by and minus Fasciola in the liver.

Fecal consideration	Existence of Fasciola spp. in liver		Total
	Fasciola (fluke positive)	Fasciola (negative)	
Eggs existing (positive)	71	0	71
Eggs absent (negative)	15	298	313
Total	**86**	**298**	**384**

It implies that faecal examination doesn't necessarily tell Fasciola in liver. Therefore, post-mortem examination of infected livers was better for diagnosis of fasciolosis in slaughtered animals as early infection can also be diagnosed.

4. Discussion

The overall prevalence of bovine fasciolosis was found to be 18.5 % and 22.40 % on the basis of coprological and postNevertheless, much higher prevalence was reported by Dechasa et al. (2012), Tadelle and Worku (2007), Tsegaye et al. (2012), Ephrem et al. (2011) and Yilma and Mesfin (2000), who stated prevalence of 46.58 %, 41.41 %, 53.48 %, 45.25 %, 90.65 %, respectively in different parts of Ethiopia. In postmortem examination of the prevalence of fasciolosis in present reading was in consistent with earlier postmortem revisions reported via Petros et al (2013), Berhe et al. (2009) and Gebretsadik et al. (2009) who described a prevalence of 21.9 %, 24.3 % and 24.32 % in Nekemte, later two in Mekele municipal abattoir. Conversely, it is considerable lesser than that of numerous additional revisions from diverse slaughterhouses in the nation and away in Africa

except 14.0 % at Wolaita Soddo abattoir (Abunna et al., 2009) in Diredawa municipal abattoir (Daniel, 1995) which was lower than this study. According to Yilma and Mesfin (2000), 90.7 % occurrence of fasciolosis in livestock slaughtered occurred at Gondar slaughterhouse, although Tolosa and Tigre (2007) noted an occurrence of 46.2 % at Jimma slaughterhouse, Phiri et al. (2005) from Zambia, Pfukenyi and Mukaratirwa (2004) from Zimbabwe informed 53.9 % and 31.7 % prevalence, correspondingly.

Current overall prevalence of Fasciolosis in cattle is lower than incidence of fasciolosis that was described by diverse portions of the nation state. The reason for this variation might be due to accessibility of humidity, ideal temperature and proper snail habitat are between types that affect growth and multiplications of intermediate host snails (Zewde et al., 2019).

An optimal temperature of 10 °C and 16°C are necessary for snail vectors of *F.hepatica*, *F. gigantica* and for the development of the Fasciola in the intermediate snail hosts. Moreover, such conditions are required for completion of the 25-life cycle such as growth of fluke eggs, miracidia searching for snails and dispersal of cercaria (Wagari, 2021).

Out of the cattle examined for Fasciola infection both by postmortem and faecal examination, more positive cases were detected by postmortem examination, while faecal examination failed to detect the same positive samples. This indicates that post- mortem examination is more important than examination for diagnosis of liver fluke (fasciolosis) in slaughtered animals as early infection can be also detected. Eggs are originated in feces as soon as flukes are now developed usually between 10 and 14 weeks of contamination (Zewde et al., 2019). Moreover, eggs are released intermittently from bile ducts, and subsequent improper sampling can also clue to a false negative result as defined via (Legesa et al., 2022). This supports the present result: the infection prevalence obtained by faecal examination is lower than the prevalence by post-mortem examination. However, the percentage agreement between the two methods was (PA = 82.56%). From the percentage agreement value, faecal examination is still good to diagnose fasciolosis in live animals.

This scholarship also discovered that around is no substantial variance (P>0.05) amongst the altered sections with detail to the frequency of *Fasciola* eggs. This might be recognized to the attendance of bulky swampy and/or water logged spaces and resemblance of agro-ecological circumstances such as altitude, rainfall and temperature preferring the progress of transitional hosts and the parasite phases.

In the current revision, the infection dominance of fasciolosis in cattle was not exaggerated by Sex of the animals. This is in covenant with numerous former information in unlike parts of the states (Keyyu et al., 2005; Phiri et al., 2005; Khan et al., 2009; Kabir et al., 2010; Kanyar et al., 2010). This may possibly be related with comparable supervision assumed to both males and females cattle. In collective browsing spaces, both females and males browse on the identical grassland and travel in finding for foodstuff and liquid composed, which expose to the similar risk of contamination. Furthermore, it could also be that fasciolosis is not an infection straight linked to animal multiplicative scheme. Though, in the reading, the quantity of male cattle inspected was greater than the female cattle. These female cattle might not have been sufficiently characterized in the revision.

Statistical analysis of infection proportions based on age showed an occurrence of 38.1% and 17.4% in <5 and >5 years, separately. There was weighty modification in infection charges (P <0.05) between diverse age sets. This might be due to the supervision scheme in which <5 age browses in the ground for little period although adults reserved inside for beef many resolution later their teeth wear out they were not capable to browse properly. However, >5 age crops before noon to night in the field, this exposes the animal to parasite for a long time. As the age enlarged to the adult step (>5 years of Age), the size of infection degree was better to an upper level. As the stage of the animal rises, the likelihood of actually exposed to Fasciola upturns and hence great occurrence of fasciolosis was informed via (Ahmed et al., 2007; Henok & Mekonnen, 2011).

On the contrary, outcomes representing converse association of occurrence proportion and age of cattle were stated by Solomon and Abebe (2007); Yilma and Mesfin (2000). This is the outcome of developed protection, which is expressed by humoral answer and tissue response in bovine liver due to prior challenge reported by (Yildirim et al., 2007; Yemisrach & Mekonnen 2012).

The connotation among the incidence of fasciolosis and body condition of the animal was originated to be scientifically significant. The maximum commonness was documented in poor body condition 60.0% than the intermediate 19.1% and good body condition 5.3%; in provision of this discovery, a learning was completed in Adwa via Mihretab et al. (2010), in Welayta sodo by Edilawit et al. (2012); in Hosanna, Bekele et al. (2014)

revealed the highest prevalence in poor body condition. The likely aim might be in line with the fact that animals with poor body condition are regularly a smaller unaffected number and are subsequently vulnerable to many diseases plus fasciolosis and because of reducing routine of the animals formed through the absence of vital nutrients and reduced supervision via owner.

The infection percentage of bovine fasciolosis on the base of breed displayed carefully major dissimilarity ($P < 0.05$). Infection level in indigenous breeds (81.7%) was larger than cross-breed (18.3%); this might be as a result of differences in the managing performs of the farmers. The indigenous breeds are cultivated beneath traditional farming scheme, and agronomists give extra consideration to cross-breed than local breeds as a result of their fabrication variances. However, the number of animals tested below cross- breed was actual lesser, related finding associate the current judgment was recounted via Dejene (2008) and Wondwossen (1990). Pos-tmortem examination of the infested livers showed that the leading species that bases fasciolosis in the reading range was *F. hepatica*. From out of 86 Fasciola infected livers directed that the frequency of *F.hepatica* (44.2%) was greater than that of *F. gigantic* (36.0%). In provision of the present-day study, similar study in Gondor, Adwa, Jimma and Mekelle, *F. hepatica* was acknowledged as the main species that bases fasciolosis (Yilma & Mesfin, 2000; Tolosa & Tigre, 2007; Gebretsadik et al., 2009; Bekele et al., 2010).This was connected through the survival of suitable environmental situation for L. truncatula (intermediary host of *F. hepatica* in the study zone) such as muddy areas, lesser irrigation and wet regions in the little lying ordinary area and provisional low ponds. Nevertheless, Fufa et al. (2009) identified that *F. gigantica* was the greatest communal liver fluke species heart-warming cattle at Welayta Soddo. The infection of cattle with *F. gigantica* and mixed infection with equally species in the current revision may possibly be owing to the aim that the cattle slaughtered in the slaughterhouse were initiated from valleys and central elevation zone flood disposed to extents and drainage channels which are favourable environments to L. natalensis (Urquhart et al., 1996). At altitudinal range of 1200-1800 M.a.s.l., mixed infection was also reported (Legesa et al., 2022).

5. Conclusion and Recommendation

The study specifies that fasciolosis disturbs the healthiness output of natures. In this study, although the prevalence is low, the infection occurrence of fasciolosis takes an association using body ailment of the animals, age and breed of the animals but not with origin and sex of the animal. Post-mortem examination appeared superior to faecal examination to determine prevalence and economic importance of livestock disease but have limitations as many organs remain undiagnosed because of meat inspectors' personal errors, use of gross pathology in diagnosis of infection and poor record keeping. Generally, faecal method of examination is important for application in field investigations and monitoring programs. In general, fasciolosis resulted in interference to the cattle invention through triggering outstanding direct or indirect damages in the scholarship ranges. The following few points of recommendation are promoted:

- Animal ought to be treated two times a year, in the raining period and in extended waterless time of year as animals might develop infection once they browse in swampy areas throughout dry times.
- Appropriate ante mortem and post- mortem assessment measures are to be carried out. Snail control methods such as destroying of boggy ranges which are favorable for snail duplication are important.
- Complementary nourishing of livestock is commended to recover the body circumstance of the animals to familiarize the harm produced via the flukes.
- Planned presentation of fluckicide and evading animals feeding from boggy terrestrial show significant achievement for the switch of fasciolosis in the revision area.
- Expansion of veterinary services has to be considered.

Data Availability:

Datasets recycled besides/ or else analysed throughout the recent training are accessible from the consistent author on even-handed request.

Conflict of Interest:

The authors announce that they have no conflict of interest.

Ethical Approval:

The Ethical assessment board of College of Agriculture and Veterinary medicine, Jimma University critically reviewed the contents and study protocol of this research and approved it. The purpose of the study was explained for the animal owners before commencement of the study, and the permission to access animal data was granted.

Authors' Contributions:

CK and TS conceived the study idea. CK designed the study, collected the study samples and drafted the manuscript. TS and ME involved in the data analysis and critical revision of the paper. CK and ME prepared the manuscript as per the author's guideline of the journal. Totally authors read and accepted the final form of the research article.

Abbreviations:

SPSS=Statistical Package for Social Science
CI= confidence interval
AM= Ante mortem examination
PM= Postmortem examination

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