International Journal of Agriculture and Animal Production
ISSN: 2799-0907
Vol : Vol. 2 No. 01 Dec 2021-Jan 2022
http://journal.hmjournals.com/index.php/IJAAP
DOI: https://doi.org/10.55529/ijaap.21.15.24

Prevalence of Bovine Fasciolosis and its Financial Loss at Gulliso Slaughter House, West Wallaga Zone Western Ethiopia

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Received: 03 October 2021 **Accepted:** 23 December 2021 **Published:** 31 January 2022

***Abstract:** A cross-sectional study conducted in Guliso, from September 2021 to June 2022 sought to identify the kind and prevalence of common Fasciola species in cattle as well as the financial damage resulting from liver condemnation. The study's foundation was a post-mortem examination of the livers of animals that had been killed at the abattoir in the Guliso municipality and its environs. 384 study animals were chosen for post-mortem examination using random systematic sampling procedures in this investigation. In the study, 128 (33.3%) cows had bovine fasciolosis overall. 54 animals (14.1%) had Fasciola gigantica, 49 animals (12.3%) had Fasciola hepatica, and 25 animals (6.5%) had mixed infections. Within the various body condition ratings, there was a significant difference (P<0.05) in the prevalence of bovine fasciolosis. Animals with poor and medium body condition ratings had the highest prevalence (96%) and lowest prevalence (84.7%), respectively, whereas animals with good body condition scores had the lowest prevalence (9.73%). Regarding age, sex, and animal origin, there was no statistically significant difference (P>0.05) in the prevalence of bovine fasciolosis. The estimated yearly financial loss at the abattoir resulting from liver condemnation linked to liver flukes was 138,528 Ethiopian birr. Given the current findings, fasciolosis may be viewed as a serious issue in the area and its environs since the ecological parameters and management circumstances support the survival of both the parasite and its intermediate host, the snail. To prevent pasture contamination and lower the worm burden from affected animals, strategic treatments must be applied at the right time. To maximize the long-term returns from such endemic locations, integrated control techniques involving livestock owners must be developed to reduce the population and activity of snail intermediate hosts.*

***Keyword:** Cattle, Fasciola, Guliso, Prevalence.*

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1. INTRODUCTION

Ethiopia produces financial income via the export of live animals, meat, edible organs, and skin. It also has a large number of ruminants, which contribute significantly to meat consumption (Akpabio, 2014). Despite having a large population of ruminants, Ethiopia is unable to fully utilize these resources for a variety of reasons, including ongoing droughts, infrastructure issues, animal diseases, inadequate nutrition, poor husbandry techniques, a lack of skilled labor, and a lack of government regulations for disease prevention and control (Negesse and Mohammed, 2014). Since fasciolosis is thought to affect 90% of ruminants worldwide, worries over meat safety and cleanliness are developing as the world's meat consumption rises (Kalu, 2015).
Trematodes of the genus Fasciola, which migrate through the hepatic parenchyma and establish and develop in the bile ducts, are the cause of fasciolisis, an economically significant parasitic disease (Addis et al., 2015). It is one of the major parasite illnesses that affect ruminants, especially cattle, and limit their output. It also causes a large spread in the morbidity and death of cattle. According to Negesse and Mohammed (2014), the two most significant species are Fasciola gigantica, which is mostly found in tropical regions, and Fasciola hepatica, which is found in temperate regions and colder high altitude regions in the tropics and subtropics.
In the fasciolosis life cycle, the snails Lymnae natalensis and Lymnae truncatula are regarded as intermediate hosts. Lymnea truncatula infections are typically linked to flocks and herds grazing moist marshy terrain. Conversely, Fasciola gigantica is a freshwater snail species, and infection with this species is linked to livestock grazing marsh and drinking from snail-infected watering spots (Tsegaye et al., 2012).
The epidemiology of the illness, clinical sign observations, and grazing history data can all be used to make the diagnosis of fasciolosis (Kassai, 1999). Confirmatory identification, however, is dependent on post-mortem examination of diseased animals by looking for fungi in the liver and coproscopic inspection in the lab (Sloss et al., 1994). Treatment for fasciolosis should be directed on adult and juvenile patients. Triclabendazole is generally effective against all developmental stages that are more than a week old. Additionally, a key component of control and preventative efforts is the reduction of the snail population (Radostits et al., 2007).
Bovine fasciolosis is a disease that is common in Ethiopia and has a negative economic impact on the production of livestock, especially sheep and cattle (Menkir et al., 2007). According to studies done by several academics in Ethiopia, the prevalence of bovine fasciolosis ranges from 20.3% to 74.0% (Mekonnen et al., 2017). With the exception of the dry northeast and east of the nation, F. hepatica has been demonstrated to be the most significant fluke species in the livestock population in the nation. Its range spans over 75% of the country. The western humid zone of the country, which includes about one-fourth of the countries, is where F. gigantica is primarily found.
According to Ahmed et al. (2007), fasciolosis is a disease that affects domestic livestock, primarily cattle, sheep, and infrequently humans, and is significant economically. According to Abunna et al. (2010), the disease causes significant financial losses for the cattle sector mostly due to mortality, liver condemnation, decreased milk and meat production, and

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anthelminthic costs. In several African countries, the frequency of fasciolosis has primarily been found at the point of slaughter (Ramajo et al., 2001). However, the inability to accurately estimate the disease's prevalence limits the amount of economic damage that can be attributed to fasciolosis at the national or regional level (Phiri et al., 2005). It has long been recognized that Ethiopia is home to fasciolosis caused by F. hepatica and F. gigantica, and numerous researchers have documented both the disease's prevalence and economic impact (Abuna et al., 2009). The Gulliso district is among the places with favorable altitude and environmental factors for fasciolosis to occur and spread. Nevertheless, there is no information on its economic impact or prevalence in the studied area. Therefore the objectives of the current study were to determine the frequency of bovine fasciolosis, evaluating the direct economic damage resulting from liver condemnation and to assess the associated risk factors of the disease in Gulliso district municipal abattoir.

2. MATERIAL AND METHODS

2.1. Description of Study Area

A cross-sectional study using post-mortem liver examinations of all slaughtered animals at the Gulliso slaughterhouse and district was carried out in order to ascertain the prevalence rate and the economic relevance of bovine faciolosis. Gulliso is situated 60 kilometers from the West Wollega zone (Gimbi) and 501 kilometers from Addis Ababa. Geographically, the town is situated between 9°30'N and 35°30'E in latitude and between 1500 and 2000 meters above sea level in longitude. It receives 1530 to 2043 mm of rain on average per year. The average yearly temperature falls between 9.5°C and 30°C, respectively. The Gulliso district Agricultural Development Office (2022) reports that there were 196230 cattle, 22537 sheep, 10477 goats, 190 horses, 7419 donkeys, 291 mule, and 238240 poultry registered as a total animal population (GDADO, 2022).

2.2. Study Population

The study population consisted of seemingly healthy slaughtered cattle that were maintained under customary management practices in various Gulliso district Peasant Associations (PAs), as well as neighbouring PAs and districts. The average daily slaughter rate, based on data from the slaughterhouse, is seven cattle. A total of 2080 cattle had been killed per year on average.

2.3. Study Design

A cross-sectional investigation was carried out to ascertain the prevalence and economic significance of faciolosis in cattle in the study area.

2.4. Sample Size and Sampling Method

T The formula given by Thrusfield (2007) was used to calculate the sample size.

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

Where n is the required sample size.
P_{exp} = expected prevalence and

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d = desired absolute precision.
Because there had never been a previous study, the sample size was 384. To choose the sample from the total study population, simple random sampling procedures were employed.

2.5. Study Techniques

2.5.1. Abattoir Survey

From September 2021 until April 2022, the Gulliso slaughterhouse was visited on a regular basis. Study animals were chosen at antemortem inspection, and at postmortem inspection, organ examinations were carried out and animal data, including age, body condition score, and animal origin, was recorded. Animals were classified as poor, medium, or good based on their physical conditions (Nicholson and Buttrworth, 1986). Based on their dentition, animals were divided into three age groups: young (less than six years), adult (6–8 years), and elderly (more than eight years) (Johnson et al., 1997). The 384 chosen calves had detailed organ checks at the abattoir as part of the abattoir survey.

2.5.2. Meat Inspection Procedures

To check for fasciola during postmortem examination, the livers were repeatedly incised after visual inspection and palpation. With the assistance of a veterinarian, the lead investigator examined the liver. Every positive sample was found in the slaughterhouse.
2.5.3. Estimation of Financial Losses Due to Fasciolosis
The average market price of the condemned liver was used to estimate the financial damage. Retailer interviews were used to ascertain the average market price of each liver. The retail market price of liver was 200 birr, and the average yearly slaughter level at the Gulliso slaughterhouse was 2080 animals. The following calculation was used to estimate the annual loss owing to liver condemned due to fasciolosis (Ogurinade and Ogunrinade, 1980).
FL = (NAS x PBF x CPLI)
Where,
FL = Financial loss
NAS = Average number of cattle slaughtered annually
PBF = Prevalence of bovine fasciolosis
CPLI = Current average price of live

2.6. Data Management and Analysis

Data from the abattoir's postmortem results were coded and entered into a Microsoft Excel spreadsheet software. Then, SPSS version 20 was used for analysis. The chi-square ($\chi 2$) test was used to evaluate host characteristics such age, place of origin, and physical condition with the faciolosis infection status. P values less than 0.05 were used to demonstrate statistical significance.

3. RESULTS

3.1. Post Mortem Examination

Fasciololosis was detected in 384 indigenous cow breeds that were killed at the municipal abattoir in Guliso. Of the animals that were evaluated, 128 (33.3%) tested positive for fasciolosis. Table 3 shows that of the 128 livers that tested positive for fasciolosis, 49 livers

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(12.8%) had F. hepatica, 54 livers (14.1%) had F. gigantica, and the remaining 25 livers (6.5%) had a mixed infection of Fasciola.

Table 1: Over all postmortem Prevalence of Fasciolosis in Guliso Municipality Abattoir during study periods.

Species of Fasciola	**Observation**	**Number of positive**	**Prevalence (%)**
F. hepatica	384	49	12.3
F. gigantica		54	14.1
Mixed infection		25	6.5
Total	**384**	**128**	**33.3**

Among 384 cattle examined at Guliso municipal abattoir, 339 were male, from these, 113 (33.3%) were positive for fasciolosis and 45 of them were females which showed 15 (33.3) prevalence of fasciolosis. There was no statistically significant difference in the prevalence of fasciolosis between female and male animal (P>0.05) (Table 2).

Table 2: Postmortem Prevalence of Fasciolosis in Considered Risk Factors

Factors	**No. of animals examined**	**Number of positive cases**	**Percentage (%)**	**X^2**	**P-value**
Sex					
Male	339	113	33.3	0.000	0.561
Female	45	15	33		
Age					
Young	103	36	34.95	0.396	0.821
Adult	150	51	34		
Old	131	41	31.3		
Origin					
Guliso	146	43	29.5	4.750	0.447
Figa	17	6	35.3		
Ayira	73	30	41.1		
Yubdo	90	30	33.3		
Lalo Kile	39	15	38.5		
Inango	19	4	21		
Body Condition					
Poor	25	24	96	2.207	0.000
Medium	92	78	84.8		
Good	267	26	9.73		

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The prevalence of bovine fasciolosis varied according to age groups, although there was no statistically significant variation (P>0.05). 43(29.5%), 6(35.3%), 30(41.1%), 30(33.3%), 15(38.5%), and 4(21%) of the 146, 17, 73, 90, 39, and 19 cattle from Guliso, Figa, Ayira, Yubdo, Lalo Kile, and Inango that were evaluated tested positive for fasciolosis. There was no discernible variation (p ~ 0.05) in the incidence of bovine fasciolosis among the six distinct origins. Within the various body condition ratings, there was a significant difference (P<0.05) in the prevalence of bovine fasciolosis. According to Table 2, animals with bad body condition scores had the highest prevalence (96%), followed by those with medium scores (84.8%), and animals with good body condition scores had the lowest prevalence (4.73%).

3.2. Estimation of Financial Losses

By applying the formula stated previously, the annual financial loss associated with fasciolosis was calculated as follows:
FL = (NAS * PBF * CPLI)
= 2080 * 33.3% * 200
= 138,528 ETB

4. DISCUSSIONS

The studies by Petros et al. (2013), Yusuf et al. (2016), Gebretsadik et al. (2009), Nuraddis et al. (2010), Meshesha and Tesfaye (2017), and others that reported prevalences of 21.9, 24.4%, 24.3%, 28%, and 30.47% at Addis Ababa Nekemt, Haramaya, Mekelle area, and Kombolcha municipal abattoirs, respectively, are in close agreement with the overall prevalence of bovine fasciolosis (33.33%) found in this study. Similarly, prevalence findings from various regions of the country were reported to be closest to the current study by Abebe et al., 2010; Ibrahim et al., 2010; Tsegaye et al., 2012; Chakiso et al., 2014; Moje et al., 2015; Yitagezu et al., 2015b; Daksa et al., 2016; Betebo, 2017a; Kasanesh et al., 2017 and Teketel, 2019. It is, nevertheless, substantially lower than the results of numerous other research from various abattoirs in the nation and other parts of Africa. Fasciolosis was found to be 90.7% common in cattle killed at the Gondar abattoir, according to Yilma and Mesfin (2000), however Tolosa and Tigre (2007) found that the disease was 46.2% common in calves killed at the Jimma abattoir. The prevalence was reported to be 53.9%, 60.42%, and 74% by (Phiri et al., 2005) from Zambia, (Pfukenyi Yeneneh et al., 2012) from Andassa, and (Mekonnen et al., 2017) from Sheno.
The current study's findings showed that there is no significant difference (p > 0.05) between the sex of the animal and the likelihood of bovine fasciolosis (table 4). This is consistent with studies by Aregay et al. (2013), Petros et al. (2013), and Rahamato et al. (2009), which found that sexual orientation has no effect on the infection rate and that males and females are equally susceptible to fasciolosis. However, it is at odds with a study by Balock and Arthur (1985) which suggested that the influence of sex on the prevalence of bovine fasciolosis could be attributed to management practices, such as keeping males outdoors for longer periods of time while keeping females indoors during the start of lactation.

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The current study's findings showed a substantial (P<0.05) correlation between an animal's physical condition and the incidence of fasciolosis (Table 4). Compared to animals with medium and good body conditioning, the prevalence was higher in animals with poor body conditioning. Because poor body condition in cattle manifests when fasciolosis reaches its chronic stage, the prevalence of fasciolosis was higher in these animals. This study supports the findings of the following reports: Aregay et al., 2013; Meshesha and Tesfaye, 2017; Yusuf et al., 2016; and Aragaw et al., 2012. However, the latter report suggests that there was no statistically significant difference between animals with good and poor body condition (P>0.05).

According to postmortem analysis of the 128 livers infected with Fasciola in the current results, the prevalence of F. hepatica (12.8%) was lower than that of F. gargantuan (14.1%), and a small percentage of the animals (6.5%) had mixed infections. Comparable research from Haramaya and Jimma municipal abattoirs revealed that 60.3% of livers harbored F. hepatica and 23.85% of livers harbored F. gigantica species, with the prevalence of F. hepatica being higher at 59% than that of F. gigantica (26%) and a specific percentage of animals (15.4%) harboring mixed infection (Yusuf et al., 2016). The availability of favorable ecological biotypes for Lymnaea truncatula, the snail vector that carries the F. hepatica virus, may be linked to the high prevalence of the virus. (Gebretsadik et al., 2009) found that 9.17% of cattle had Fasciola gigantica infection and 56.42% of cattle had Fasciola hepatica infection, supporting the current findings. Cattle at the Bahr Dar municipal abattoir had infection rates of F. hepatica (49.78%), F. gigantea (29%) and mixed infection (20.9%), according to (Amsalu, 2008). According to (Wakuma, 2009), the Bedele Municipal Abattoir has a prevalence of F. hepatica (64.5%), F. gigantea (24.8%), and mixed (10.7%). The Jimma Municipal Abattoir (Abie et al., 2012) reported that the prevalence of F. hepatica (65.4%), F. gigantea, mixed, and juvenile flukes of Fasciola species were 36.0%, 11.5%, and 10.1%, respectively. This discrepancy could be explained by the study area's geographic variations and the study season.

A total of 138,528 ETB was computed as the annual economic losses incurred in Guliso town as a result of the condemnation of contaminated liver. This conclusion is quite similar to that of Daniel (1995), and Abebe et al. (2010), who reported that fasciolosis in cattle at Ziway, Dire Dawa Municipal Abattoir, and Hawassa Municipal Abattoir resulted in annual total economic losses of 154,188 and 215,000 ETB, respectively. These increased values might result from more animals being killed at the abattoirs in Dire Dawa, Ziway, and Hawasa. The results, however, are far lower than those published by (Petros et al., 2013; Ibrahim et al., 2010; Bayu et al., 2013 Moje et al., 2015; Addis et al., 2015; Yitagezu et al., 2015b and Niguse, 2020) who reported a total loss of 63072 ETB, 49491ETB, 57684ETB, 47124ETB, 63504ETB, 28360.6ETB and 39370 ETB from condemned liver due to fasciolosis in Nekemte, Kombolcha, Addi Ababa, Areka, Dembi Dolo, Bedele and Tembaro municipal abattors. This could be because various amounts of animals are killed in each town and because the price of liver varies depending on where you reside (Guliso and Nekemte). The quantity of intermediate hosts and the ecological circumstances in the vicinity may also be factors influencing the decline in the economic loss.

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5. CONCLUSIONS AND RECOMMENDATIONS

Fasciolosis was generally observed to be common in the research locations. This will significantly reduce direct or indirect losses in the research regions, which will impede the production of animals. The discovery of bovine fasciolosis in this investigation indicated that the study area had suitable ecological and meteorological conditions for the growth and survival of the Fasciola species as well as intermediate hosts. Additionally, it proved that the two species of liver flukes—Fasciola hepatica and Fasciola gigantic—existed in regions that supplied the Guliso district with slaughter cattle. It may be inferred from the high prevalence of fasciolosis in the study that fasciolosis is a major cause of the productivity losses in cattle. Therefore, focus should be placed on developing and implementing effective parasite control measures throughout the nation's various agro ecologies as well as educating farmers about the disease's lifecycle and effects. Additionally, fluckicide used strategically and keeping animals off of marshy soil are important factors in the efficacy of fasciolosis control in these study sites.Education of the farmers should be carried out about the management system of their animals to minimize its risk of occurrence in their livestock population. Control should be on preventive rather than treatment.

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