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Prevalence of bovine fascilosis in municipal Abbatoir of Adigrat, Tigray, Ethiopia

Prevalencia de la fasciolosis bovina en el matadero municipal de Adigrat, Tigray, Ethiopia

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RESUMEN

Se realizó una investigación cruzada para determinar la prevalencia de la fasciolosis bovina y sus factores de riesgo asociados en el matadero municipal de Adigrat. Los resultados han revelado que prevalencia en el matadero fue 21.50 % (112/522). De modo semejante, la prevalencia de los parásitos en hembra y en el macho resultó ser 22.2 % (2 / 9) y 20.50 % (105/513) para la *F. hepática* y 1 % (5/513) y 0 % (0/9) respectivamente. Al mismo tiempo la prevalencia de parásitos en adultos y crías en el matadero para *F. hepática* fue 20.9 % (104/498) y 12.5 % (3/24). La *F. gigantica* fue 1 % (5/498) y 0 % (0/24). La prevalencia de los dos parásitos en el matadero, relacionados con el sexo y la edad no fueron estadísticamente significativas. De modo semejante se determinó la prevalencia en las razas locales y cruzadas, la que fue del 19 % (80/421) y 26.7 % (27/101) para la *F. hepática* y 1.2 % (5/421) y 0 % (0/101) para *F. gigantica* respectivamente. Sin embargo, tal variación de la prevalencia entre las razas locales y cruzadas no fue estadísticamente significativa (P > 0.05). Además, los animales procedentes de la región montañosa y de las zonas bajas tiene tienen prevalencia de 21.7 % (107/494) y 0 % (0/28) para *F. hepatica* y 0 % (0/494) y 17.9 % (5/28) para *F. gigantica* respectivamente. La diferencia entre las regiones montañosa y bajas fueron estadísticamente significativa (P < 0.05). Los resultados también muestran

el predominio de *F. hepática* en las áreas con animales de pobre condición corporal, media y buena condición corporal fueron 46.7 % (7/15), 19.4 medio % (79/407), y de 21 % (21/100) y con buena condición corporal : 46.7 % (7/15), 19.4 % (79/407), y 21 % (21/100) respectivamente pero en la *F. gigantica* fue 0 % (0/15), 1 % (4/407) y 1 % (1/100) respectivamente. Estos resultados también muestran que la diferencia de la prevalencia entre las condiciones corporales no fue estadísticamente significativa (P > 0.05). Los resultados actuales expresan que la fasciolosis es una enfermedad parasitaria que afecta la mayor parte de ganado y la más común en la región por lo tanto, las estrategias de control deberían ser diseñadas para minimizar el predominio de la infestación mediante la desparasitación de los animales, y el desagüe de áreas húmedas. Los datos fueron procesados mediante el paquete estadístico SPSS versión 17.

Palabra sclaves: Edad condición, raza, ganado, *F. gigantica, F. hepatica*, pevalencia, sexo.

ABSTRACT

A cross-sectional study was conducted to determine the abattoir prevalence of bovine fasciolosis and its associated risk factors in Adigrat municipal abattoir. The current finding revealed that the overall abattoir prevalence was 21.50 % (112/522). Similarly, the abattoir prevalence of the parasites in female and male also showed it was 22.2% (2/ 9) and 20.50% (105/513) for *F. hepatica* and 1% (5/513) and 0% (0/9) respectively. At the same time the abattoir prevalence of the parasites in adult and young for *F. hepatica* was 20.9% (104/498) and 12.5% (3/24) but that of *F.gigantica* was 1% (5/498) and 0% (0/24). The abattoir prevalence of the two parasites between sex and age was not statistically significant. Similarly the abattoir prevalence in local and cross breeds were also determined and it was 19% (80/421) and 26.7% (27/101) for *F. hepatica* and 1.2% (5/421) and 0% (0/101) for *F. gigantica* respectively. Even though, such variation of prevalence between local and cross breeds exist it was not statistically significant (P>0.05). In addition, animals originated from highland and lowland has the prevalence of 21.7% (107/494) and 0% (0/28) for *F. hepatica* and 0% (0/494) and 17.9% (5/28) for *F.gigantica* respectively. The difference of the prevalence between highland and lowland was statistically significant (P<0.05). The current finding also showed the prevalence of *F.hepatica* in poor, medium and good body condition animals was 46.7%

(7/15), 19.4% (79/407), and 21% (21/100) respectively but that of *F. gigantica* was 0% (0/15), 1%(4/407) and 1% (1/100) respectively. This result also showed the difference of the prevalence among the different body condition was not statistically significant (P>0.05). The current finding showed fasciolosis is the most common and economical parasitic disease affecting cattle in the region hence, control strategies should be designed to minimize the prevalence of the infection via deworming of animals, drainage of swampy areas and practicing of zero-grazing and application of molluscide drugs in the environment.

Key words: Age, body condition, breed, cattle, *F.gigantica, F. hepatica*, prevalence, sex.

1. INTRODUCTION

Ethiopia have an estimated livestock population of approximately 49.3 million cattle, 25.02 million sheep, 27.88 million goats, 8.41 million equines, 1.06 millions camels, 20,000 pigs, and 58 millions chickens, which stands first in Africa and tenth in the world (CSA, 2008). The population of animals in Tigray region is 4,201,501 cattle, 34, 506,64 shoats, 400,334 equines, 14,889 camels, 2,452,012, poultry 155,434 dogs, and 185,373 cats (BOARORT, 1997) of which the wereda Ganta afeshum have the proportion of livestock consists of 51, 514 cattle, 60, 040 sheep, 30, 050 goats, 7,008 equine and 67, 769 poultry (GBOANR , 1999)

In the country, the main agricultural output is generated from crop and livestock integrated systems. Livestock contribute over 40% of the value of annual agricultural production and not less than 15% the gross national production, and it covers about 19% of the export earnings (CSA, 2008). Though, Ethiopia has substantial livestock resources, its level of productivity is low due to constraints of disease. Out of these diseases, fasciolosis is one of the significant diseases of animals. Fasciolosis is a parasitic disease mainly of sheep, cattle, goats and buffaloes caused by two major species namely *F. hepatica* and *F. gigantica* which are responsible for the disease in cattle and sheep, characterized by weight loss, anemia and hypoproteinemia (Urqauhrt *et al*., 1996). The distribution of liver flukes depends on the presence of intermediate snail (Lymnaea truncata and Lymnaea natalensis) hosts.

Different factors are contributing for the outbreaks of fasciolosis such as availability of suitable snail habitats as *trunculata* prefers wet mud to free water, and permanent habitats include the banks of ditches or streams and the edges of small ponds. Following heavy rainfall or flooding, temporary habitats may provide by hoof marks, wheel ruts or rain ponds. Fields with clumps of rushes are often suspect sites. In addition, a slightly acid pH environment is optimal for L. t*runcatula, excessively* acid pH levels are detrimental, such as occur in peat bogs, and areas of sphagnum moss. (Urquhart *et al*., 1996). The ideal moisture conditions for snail breeding and the development of *F. hepatica* with in snails are provided when rainfall exceeds transpiration, and field saturation is attained. Such conditions are also essential for the development of fluke eggs, for miracidia searching for snails and for the dispersal of cercariae being shed from the snails. (Urquhart *et al*., 1996).

Generally, the distribution of fasciolosis is worldwide, however, the distribution of *F.hepatica,* is limited to temperate areas and highlands of tropical and sub-tropical regions (Soulsby, 1982).The geographic distribution of trematode species is dependent on the distribution of suitable species of snails. The genus Lymnaea in general and *L.trancatula* in particular is the most common intermediate hosts for *F. hepatica*. This species of snail was reported to have a worldwide distribution (Urquhart *el al.,* 1996). The presence of fasciolosis due to *F. hepatica* and *F. gigantica* in Ethiopia has long been known and its prevalence `has been reported by several workers; different works so far conducted. In Ethiopia reported variable prevalence rates of bovine fasciolosis in different localities of the country (Getu, 1987; Abebe 1988; Mulugeta, 1993; Dagne, 1994; Wondwosen, 1990; Yosef, 1993; Adem, 1994; Mezgebu, 1995).

The economic losses due to fasciolosis throughout the world are enormous and these losses are associated with mortality, morbidity, reduced growth rate, condemnation of liver, increased susceptibility to secondary infections and expense due to control measures (Malone *et al*., 1998). A rough estimate of the economic loss due to decreased productivity caused by bovine fasciolosis is about 350 million birr per annual (Bahiru and Ephrem, 1979).

In the study area the livestock population is very high and the management of the animals is extensive type of system. Besides there are numerous marshy areas which serves as water sources for the animals due to the irrigation system which helps them as means of food security hence, this will serve as conducive environment for the multiplication of the intermediate hosts. In addition, there are high condemnation rates of liver due to this parasite in the municipal abattoir and also there is no study conducted to

asses the prevalence of the parasites in the study site except few study conducted around Adwa and Mekelle. Therefore the objectives of the research is

- ✓ To determine the prevalence of the parasite and its associated risk factors in the abattoir

2. MATERIALS AND METHODS

2.1. Study area

The study was conducted in eastern zone of Tigray, called Adigrat abattoir. The wereda has different agro-ecological areas namely sub moist dry, sub moist cool and sub dega. The annual rain fall ranges from 400-600mm and the minimum and maximum temperature ranges from 6-21.8^{O}C with an altitude of 2000-3000 meter above sea level. In the study area the maximum rain fall occurs from mid June up to September and between March and May but the minimum rain fall occurs from April to May. The farming system is mixed farming system; crop cultivation and animal husbandry similar to that of most Ethiopian husbandry system are practiced (GBOANR, 1999).

2.2. The Study Animals

The study animals were cattle' brought to the abattoir from different market of the zone such as Edagahamus, Hawzen, Wukro, and Atsbi-wemberta**.**

2.3. Study design

The cross sectional study was employed to examine animals which were slaughtered in the abattoir and the observation at each and every individual animal were both ante-mortem and postmortem examination. Complete ante-mortem examination of the animals was carried out a day before or shortly prior to slaughter. Inspection of the animals was made while at rest or in motion for any obvious sign of disease. During the postmortem the liver of the animals were examining for detection of the presence of adult fasciola from the bile ducts in the abattoir.

2.4. Sampling techniques and sample size determination

For the antimortem examination of animals so as to observe the external abnormalities like emaciation, submandibular edema animals were examining before slaughter and each and every animals were tagged with

identification number before the slaughter commences and each animal which was examining during the antimortem were also observed for the postmortem results and in-order to determine the sample size of the animals expected prevalence of 24.32% which was reported by Gebretsadik *et al.* (2009) was used with absolute precision of 5% and confidence level of 95% hence the sample size of the animals were 282 according to the formula given by Thrustfield (2005). But to increase the precision of the result a total of 522 cattle were examined

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

Where n= total number of sample size
Pexp=expected prevalence
d= absolute precision

3. RESULTS

The study revealed that the overall abattoir prevalence of bovine fasciolosis was 21.50% (112/522). The prevalence between female and male cattle also showed that it was 22.2%) (2/9) and 20.50% (105/513) for *F.hepatica* and 0% (0/9) and 1% (5/513) for *F.gigantica* in as indicated in (Table1).

Table1. Abattoir prevalence of bovine fasciolosis by sex.

Sex	Total examined	Prevalence in%		
		F.hepatica	*F.gigantica*	P-value
Male	513	105(20.5%)	5(1.0%)	0.950
Female	9	2(22.2%)	0(0%)	
Over all	522	107(20.5%)	5(1.0%)	
Total	522			

The abattoir prevalence of fasciolosis between the age group also indicated that the prevalence of *F. hepatica* was 12.5% (3/24) and 20.9% (104/498) in young and adult cattle respectively. Similarly, the prevalence of *F.gigantica* in young and adult cattle were 0% (0/24) and 1% (5/498) and the difference between the prevalence of the parasites in both sex are not statistically significant (P>0.05) (Table 2)

Table 2. Abattoir prevalence of bovine fasciolosis by age.

Age	Total examined animals	Prevalence in%		P-value
		F.hepatica	*F.gigantica*	
Young	24	3(12.5%)	0(0%)	0.527
Adult	498	104(20.9%)	5(1.0%)	
Total	522	107(20.5%)	5(1.0%)	

Similarly, the abattoir prevalence of the parasites between the different breeds were also assessed and the prevalence of *F. hepatica* in local and cross breeds were 19% (80/421) and 26.7% (27/101) respectively and that of *F. gigantica* was 1.2% (5/421) and 0% (0/101) respectively. The statistical result also showed that there was no significance difference between breeds (P>0.05).

Table 3. Abattoir prevalence of bovine fasciolosis by breed.

Breed		Prevalence		P-value
		F.hepatica	*F.gigantica*	
Local	421	80(19.0%)	5(1.2%)	0.134
Cross	101	27(26.7%)	0(0.0%)	
Total	522	107(20.5%)	5(1.0%)	

In addition, the abattoir prevalence of the different parasites were also assessed based on the origin of the animals and it was found that these originated from highland and low land have the prevalence of 21.7% (107/494) and 0% (0/28) for *F. hepatica* and 0% (0/494) and 17.9% (5/28) for *F. gigantica* respectively. The difference between the prevalence of the parasites between the two origin is statistically significant (P<0.05) as indicated in (Table 4).

Table. 4. Abattoir prevalence of bovine fasciolosis by origin

Origin	Total examined animals	Prevalence		p.value
		F.hepatica	*F.gigantica*	
High land	494	107(21.7%)	0(0.0%)	0.000
Low land	28	0(0%)	5(17.9%)	
Total	522	107(20.5%)	5(1.0%)	

The abattoir prevalence of both fasciola based on the body condition of the animals were also assessed and the prevalence for *F. hepatica* was 21% (21/100), 19.4% (79/407) and 46.7% (7/15) in medium, good and poor body conditioned animals and its rate for *F. gigantica* was 1% (1/100), 1% (4/407) and 0% (0/15) in medium, good and poor body condition cattle respectively. The difference among the body condition of the animals were not statistically significance (P>0.05).

Table 5. Abattoir Prevalence of bovine fasciolosis by body condition

Body condition	Total examined animals	Prevalence		P.value
		F.hepatica	*F.gigantica*	
Good	100	219(21.0%)	1(1.0%)	0.154
Medium	407	79(19.4%)	4(1.0%)	
Poor	15	7(46.7%)	0(0.0%)	
Total	522	107(20.5%)	5(1.0%)	

4. DISCUSSION

Fasciolosis is widespread ruminant health problems and causes significant economic losses to the livestock industry in Ethiopia. As reported by (Brook *et. al.,* 1985; Heinonen *et al.,* 1995) water logged and poorly drained areas with acidic soils in the highlands are often endemic areas for fasciolosis.

The overall abattoir prevalence of fasciolosis in the present study was 21.5% which is lower than that of the study conducted by Abdul (1992) and Adem (1994) with the rates of 47% and 56.6% at Sodo and Ziway municipality abattoir respectively but it is higher as compared to the study conducted by (Daniel, 1995) having a prevalence of 14.4% more or less similar prevalence with the current study. More ever the current study is lower than that of the study conducted by Gebretsadik *et al*. (2009) with the prevalence of 24.32%.

The abattoir prevalence of the parasites in female and male also showed it was 22.2% (2/ 9) and 20.50% for *F. hepatica* and 0% and 1% for *F.gigantica* respectively. This finding was in agreement with the study conducted by (Daniel, 1995) with the prevalence of these parasites higher in male than female. This might attributed to the proportion of animals sampled during the post mortem examination as most of the time male animals were slaughtered in the slaughter houses as compared to female

animals. The variation of the prevalence between male and female animals was not statistically significant (P>0.05).

The abattoir prevalence of the parasites in adult and young for *F. hepatica* was 20.9% and 12.5% but that of *F.gigantica* was 1% and 0%. This finding was lower than that of the study conducted by Abebe *et al.* (2011) with the prevalence of 30.04% and 35.97% in adult and young animals respectively. Even though such variation of the prevalence was exist it is not statistically significant (P>0.05).

More ever, the abattoir prevalence in local and cross breeds was also determined and it was 19% and 26.7% for *F. hepatica* and 1.2% and 0% for *F. gigantica* respectively. This variation might be due to the management of the animals as most of the animals were reared in the extensive system of management which makes them easily susceptible to the parasites. Even though, it was higher in cross breeds than local breeds it was not statistically significant (P>0.05)

Similarly, animals originated from highland and lowland has the prevalence of 21.7% and 0% for *F. hepatica* and 0% and 17.9% for *F.gigantica* respectively. The current finding is lower than the study conducted by Rahmeto *et al.* (2008) with the prevalence of 58.9% and 10.6% respectively. This might be due to the geographical variation which is important for the multiplication of the intermediate host. Similarly, variation in climate-ecological conditions such as altitude, rainfall, temperature, livestock management system, and suitability of the environment for survival and distribution of the parasite as well as the intermediate host might have played their own role in such differences. One of the most important factors that influence the occurrence of fasciolosis in a certain area is availability of suitable snail habitat (Urquhart *et al.,* 1996). In addition, optimal base temperature to the levels of 10 ºC and 16ºC are necessary for snail vectors of *Fasciola hepatica* and *Fasciola gigantica*, respectively. These thermal requirements are also needed for the development of Fasciola with in the intermediate host. The ideal moisture conditions for snail breeding and development of larval stages within the snails are provided when rainfall exceeds transpiration and field saturation is attained. Such conditions are also essential for the development of fluke eggs, miracidiae searching for snails and dispersal of cercariae (Urquhart *et al.,* 1996). The difference of prevalence of the parasites exist in the two agro ecological zones its rate was statistically significant (P<0.05)

The prevalence of the parasites in the different body condition of the animals were also determined and its prevalence for *F.hepatica* and *F.gigantica* in poor body condition was 46.7% and 0% but in medium body condition

19.4% and 1% and in that of good body condition animals it was 21% and 1%, respectively. The current finding was lower for *F.hepatica* and *F. gigantica* in animals having poor body condition 23.1% and 11.9% Mihreteab *et al.* (2010). This might be due to due to the fact that animals with poor body condition are usually less resistant and are consequently susceptible to infectious diseases. The prevalence of the parasites in medium body condition in the present finding was higher for *F. hepatica* with the rate of 14.5% but lower than that of previous finding with the prevalence of *F.gigantica* 8.1% respectively but as compared to the current study the finding in the previous study conducted by Mihreteab *et al.* (2010) was lower than that of the current finding with the prevalence of 13.9% and 3.9% respectively. Even though, the prevalence in the different body condition of the animals was varied it was not statistically significant (P>0.05).

5. CONCLUSION AND RECOMMENDATIONS

Fasciolosis is a serious health problem of cattle which causes liver condemnation in the abattoir, reduction in the production of the animals. In the current finding the abattoir prevalence of the parasites showed the disease is common in most parts of the zone as most of the animals were originated from the different sites of the zone. The most predominant *Fasciola* in the zone was *F.hepatica* which might be due to suitability of the environment for multiplication of the intermediate hosts. The prevalence in the different breeds of the animals also indicate the existence of the parasite which was higher in local breeds than cross breeds and it is also common in female animals as compared to male. Similarly, the parasite mostly affects animals originated from high land and adult animals. This shows the disease is common in the region due to different activities such as irrigation and ponds which merits attention by the responsible bodies to control the parasites.
There fore based on the current finding the following points were recommended

- Standard regulations and functional meat inspection policies should be formulated for organs and carcass approval/ rejection.
- Awareness creation for farmers should be advocated
- Improving of the veterinary service and infrastructure in prevalence area with provision of modern antihelemntics and treatment is giving based of the weight of the animal.
- Control of intermediate host snails through drainage.

- ❖ Practicing zero grazing is important in the control of the disease
- ❖ Regular deworming of animals before and after the rainy season is important
- ❖ Application of molluscide drugs are important in the control of the intermediate hosts
- ❖ Drainage of swampy area is also important in the reduction of the intermediate host
- ❖ Further epidemiological investigation should be encouraged to assess the worm burden, its associated risk factors and its indirect economic loss

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