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Prevalence of Bovine Fasciolosis in and Around Chena District in South Western Ethiopia

Temesgen Fikre

National Institute for Control and Eradication of Tsetse Fly and Trypanosomosis,
Kaliti Tsetse fly Mass Rearing and Irradiation Center, Addis Ababa, Ethiopia

Abstract: *Fasciola* species are causative agents of parasitic disease in domestic animals. It principal affects the vital organ of the animals, in particular the liver. A cross sectional study was carried out between November 2014 to March 2015, with the aims of determining prevalence of bovine faciolosis in and around Chena district and assessing the risk factors of the disease in the study area. The study was based on coprological examination using sedimentation techniques and post mortem inspection of livers of slaughtered animals samples collected from zebu cattle of Chena and its surrounding areas. From total sample of 384 fecal and 53 liver samples examined, 46 (12.0%) and 7(13.3%) were positive for fasciolosis respectively. *Fasciola hepatica* was found to be the most prevalent species in the study accounting for 7.55% where as *F. gigantica* and mixed of *Fasciola* species were found to be 1.9% and 3.77% respectively during necropsy examination. Body condition wise analysis, statistically significant variation ($P<0.05$) on the prevalence of fasciolosis was observed. Poor body condition cattle were more susceptible than good body condition cattle with prevalence of 18.2% and 7.8%, respectively. However statistically significant variation wasn't observed among age and Sex. The adult animal was frequently affected compared to the young. As to the prevalence rates on sex basis, prevalence rates of 19 (13.0%) and 27 (11.3%) in female and male were observed respectively. Similarly, there wasn't significant variation in prevalence rate of Fasciolosis among the origin of the animal. The highest prevalence rate was observed in kossa (21.9%) followed by kocha (14.6%) and Buttahora Peasant associations (13.0%). Thus, fasciolosis was proved to be widely distributed disease with relatively high prevalence and great impact on the economy. Therefore, more detailed study on ecology and biology of the snail and its effective control measures should be planned.

Key words: Chena District · Bovine · Coprology · Economic Significance · Fasciolosis · Necropsy · Prevalence

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa, yet produces insufficient animal protein and other livestock products to meet the demand of fast growing human population. The contribution of livestock industry to the national economy is considerably less than its tremendous potential. Among many constraints that made the livestock sector marginal is due to prevalent of different diseases, malnutrition and management constraints [1].

Parasitism represents a major obstacle to the development of the sector. One among the parasites is liver fluke. Flukes of ruminants are flat worm (trematodes) parasites living in liver (*Fasciola*, liver fluke), proventriculus (*Paramphistomum,* rumen fluke) or blood (*Schistosoma*, blood fluke) [2]. The life cycles of flukes are always indirect, involving one or two intermediate hosts before invasion of definitive hosts. The snails such as *Lymnaea truncataula*, aquatic snail with a wide distribution throughout the world, are the intermediate host for *Fasciola hepatica* [3]. *Lymenae natalens is* an

Corresponding Author: Temesgen Fikre, National Institute for Control and Eradication of Tsetse Fly and Trypanosomosis, Kaliti Tsetse fly Mass Rearing and Irradiation Center, P.O. Box: 19917, Addis Ababa, Ethiopia.

amphibian snail is important intermediate host for *Fasciola gigantica* in Africa [4].

Fasciolosis occurs commonly as a chronic disease in ruminants and the severity sometimes depends on the nutritional status of the host. Bovine *Fasciolosis* is an economically importance trematode infection of cattle caused by liver flukes such as *F. hepatica* and *F. gigantica*. *Fasciola* cause substantial economic losses by the death of the animal, loss in carcass weight, reduction in milk yield, condemnation of affected liver, declining of reproduction performance of infected animals, predisposing of animals to other diseases and the cost of treatment of the parasite [5]. The annual loss due to endo-parasitism including fasciolosis in Ethiopia is estimated at 700 million birr [6].

F. hepatica has been shown to be the most important species in Ethiopia livestock with distribution over three quarter of the nation except in the arid northeast and east cost of the country. The distribution of *F. gigantica* was mainly localized in the western humid zone of the country that encompasses approximately one fourth of the nation [7]. Despite the significance of the parasite infection, there is no documented report on the occurrence of this parasite in and around Chena district. Therefore, the objectives of the study were:

- To determine the prevalence of bovine fasciolosis in the study area.
- To assess the risk factors of the disease in the study area.

MATERIALS AND METHODS

Study Area and Period: The study was conducted from November 2014 to March 2015 in and around Chena District; it is 537 km away from Addis Ababa in south west direction, 88 km from Keffa zone in south direction and 810 Km away from the regional capital city, Hawassa, Ethiopia. The area has a latitude and longitude of 35°30'S and 36°E with an elevation from 1050 to 2320 M.S.L. The area is characterized agro-ecologically as mostly semi low land and highland with an annual rainfall ranging from 1103 to 1356 mm, temperature from 19 to 29°C. Moreover, the compound covers 1349 hectares, out of which 652 covered by pasture land, 367.2 covered by bush land and 329.8 hectares covered with marshy land [8] (Fig. 1).

Study Animals: A total of 437 heads of different age and sex groups of cattle were randomly selected. Out of the above total number of animals 384 were subjected to qualitative coprological examination and 53 were

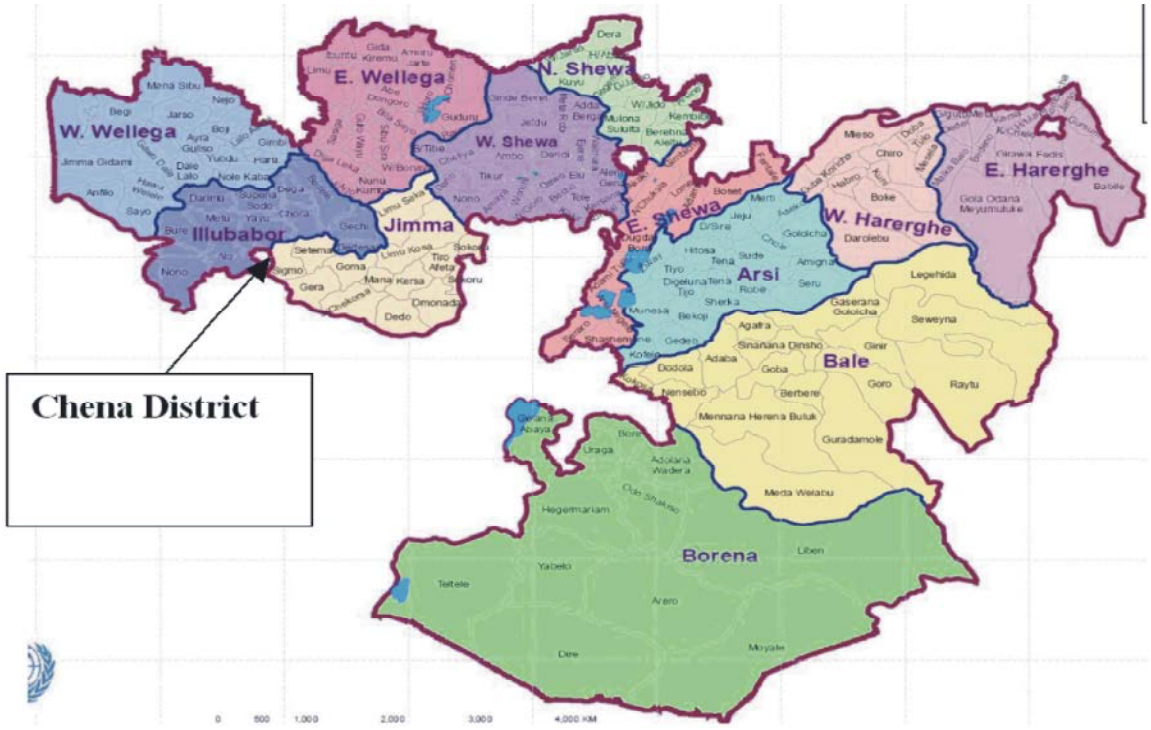

Fig. 1: Map of study area: SNNPR (South western Regional State), Ethiopia

slaughtered and post-mortem examination was carried out by inspection, palpation and incision of the organs of the carcass for the detection of *Fasciola* in its' predilection sites. The animals examined for this purpose were local (zebu) breed, which were coming from different agro-ecological Peasant associations of Chena district to the Veterinary Clinic such as Alewa, Wacha, Kulush, Kocha, Boba-bela, Buta-hora, Gota, Wota, Kosa and Wara-bemba.

Sample Size: Since there was no previous study in Chena district to establish the prevalence and economic significance of bovine fasciolosis, the sample size was determined by taking the prevalence of 50% fasciolosis using the formula given by Thrusfield accordingly the sample size will be 384 for coprological study. Besides, a census type of sampling was employed involving examination of all animals slaughtered in all abattoir during the study period in order to ensure the representativeness as well as precision of the findings. Accordingly, it was possible to examine a total of 53 heads of cattle slaughtered at the selected Chena municipal abattoirs, Ethiopia as suggested by Thrusfield [9].

Study Design: A cross-sectional study was conducted to determine the prevalence of fasciolosis in the study area.During the study period to determine the prevalence of ovine Fasciolosis in the study area. For this study simple random sampling was conducted. During sampling, animals origin, sex, age and body condition score were recorded. The body conditions were grouped in to two and animals that score 0-3and 4-5 are classified as poor and good body conditions, respectively. The age of bovine were classified in to two; bovine with the age of up to 1 years as young and bovine with more than 1 years as adult [10].

Sampling Method

Coprological Examination: Prior to sampling; an identification number was given to each animals presented for sampling. Fecal sample were collected directly from rectum of animals. The feces were collected by hands protected by rubber gloves, using two fingers. The samples were taken to the laboratory in tightly closed universal bottles and examined for Fasciola eggs by using sedimentation technique.

Post Mortem Examination: The postmortem examination of slaughtered animals was carried out by inspection, palpation and incision at various angles of different organs, approximately 4 cm deep to check for the presence of adult flukes in the examined liver. The fluke recovery was conducted following the approach of Hammond and Sewell [11], as follows: the gall bladder was removed and washed to screen out mature flukes. The liver was cut into slices of about 1cm thick and put in a metal trough of warm water to allow mature flukes lodged in smaller bile ducts to escape and then the heads of the flukes were counted. Identification of the fluke species involved was carried out based on the morphological features of the agent and classify in to *F. hepatica, F. gigantica*, mixed and unidentified or immature forms of liver fluke [11, 12].

Identification of *Fasciola* species: Species level identification of flukes was conducted based on the size, parameters and morphological features described by Soulsby and Urquhart *et al.* [13, 14] as follows. The well collected and preserved adult *fasciola* were identified under stereomicroscope. *F. hepatica* has leaf like shaped, broader anteriorly than posterior with an anterior cone shaped projection which followed by a pair of broad shoulder. It is grayish-brown color, changing to grey when preserved. The ventral sucker is situated at the level of the shoulders and is about large as the oral. Whereas *F. gigantic* resembles *F. hapatica* but it is readily recognized by its longer size in length and narrow width. The anterior cone is smaller than of *F. hepatica*, the shoulder is not as prominent and the body is more transparent.

Data Management and Analysis: Data obtained from history, necropsy and coprosopic examination was recorded on spread sheet of Microsoft excel and analyzed with statistical method Stata 7.

RESULTS

Coprological Result: Coprological examination conducted from November 2014 to March 2015, from a total of 384 fecal sample examined 46 (12%) were positive for fasciola eggs. Nevertheless, there wasn't significant variation on prevalence rate of fasciolosis among the origin of the animal. The highest prevalence rate was observed in kossa Peasant association (21.9%) followed by kocha (14.6%) and Buttahora Peasant association (13.0%) (Table 1).

Table 1: Coprological finding of bovine fasciolosis based on the Peasant association of the study areas assessed by Chi-square

Peasant Association	Total sample (n)	Positive (n)	Prevalence %	χ^2 (P- value)
Alewa	10	0	0	
Wacha	98	11	11.2	
Kulush	64	5	7.8	
Kocha	48	7	14.6	
Bobabela	29	3	10.3	7.6(0.57)
Butahora	46	6	13	
Gota	18	2	11.1	
Wota	24	3	12.5	
Kosa	41	9	21.9	
Warabeba	6	0	0	
Total	384	46	12.00%	

Table 2: Associations of different risk factors with Bovine fasciolosis assessed by Chi-square

Risk factors	Sampe (n)	Positive {n)	Prevalence%	χ^2 (p value)
		Sex		
Female	156	19	12.2	0.0042(0.948)
Male	228	27	11.8	
		Body condition		
Good	230	18	7.8	4.41(0.036)
Poor	154	28	18.2	
		Age		
Old	217	35	16.1%)	3.46 (0.063)
Young	167	11	6.60%	
Over all	384	46	12	

Table 3: Frequency of *Fasciola* species among examined livers in four municipal abattoirs.

Origin of animal	Total sample (n)	*F. gigantica*	*F. hepatica*	Mixed infection	Positive (%)	χ^2 (P- value)
Balashasha	6	0	0	0	0(0%)	
Wachamaji	21	0	3	1	4(7.5%)	
Shewabiench	10	0	0	1	1(19.0%)	1.634(0.652
Shishida	16	1	1	0	2(12.5%)	
Total	53	1(1.9%)	4(7.5%)	2(3.7%)	7(13.3%)	

Table 4: Comparsion of coprological and postmortem examination

Result	Coprological examination	Postmortem examination	χ^2 (P- value)
Positive	46 (11.97 %)	7 (13.3%)	
Negative	338(88.0%)	46 (86.7%)	0.0659(0.797)
Total	384	53	

Based on risk factor wise analysis, variable such as age and sex were not significantly associated with prevalence of fasciolosis. The adult animal was frequently affected compared to the young. As to the prevalence rates on sex basis, prevalence rates of 19 (13.0%) and 27 (11.3%) in female and male were observed respectively (Table 2). However, Analysis on the prevalence of fasciolosis in relation to body condition of animal showed statistically significance differences ($P< 0.05$) indicating an inverse relation in prevalence with body condition score. The prevalence was found to be 18.2% and 7.8% based on coprological finding for poor and good body condition respectively (Table 2).

Postsmortem Findings: Out of a total of 53 indigenous cattle(zebu) slaughtered and examined at Chena municipality abattoir from January to March 2015, seven (13.2) animals were found to be positive for *fasciola* species. Though the difference in prevalence of fasciolosis among origin of animal wasn't stasticaly significant, The highest prevalence rate was recorded in wachamaji 4(7.5%) where as the lowest prevalence rate was also observed in Balashasha municipal abattoirs (Table 3). From 7 positive liver examined 7.5% infected with *Fasciola hepatica*, 1.9% with *Fasciola gigantic* and 3.7% with mixed infection (Table 3). The overall prevalence rate was recorded higher during postmortem

examination than coprologicaly techniques with prevalence of 46(12%) and 7(13.2%) respectively but the difference wasn't statistically significant as presented in Table 4.

DISCUSSION

The present study was designed to determine prevalence and assess risk factors associated with bovine fasciolosis. It revealed that an overall prevalence of fasciolosis was 12% (46/384) and based on coprological investigation of bovine fasciolosis. This study was closely in agreement with the previous report by edilawit *et al*. [15] who reported 15.3% in wolayiat sodo, Ethiopia. However this finding was much lower than the results of most of the earlier studies in Ethiopia [16-18] who reported 21.33% in kefa zone, 28% and 21.2%, in wolayita sodo respectively. However, studies in different parts of Ethiopia showed a huge variation of prevalence rate ranging from 20.3% to 90.7% [19 -22]. This disparity could have been attributed to the differences in climatic and ecological conditions, study methodology and sampling strategy. In addition to the variations in climatic and ecological conditions, the seasons in which the studies were conducted could contribute to the variations that exist among different findings in different areas [23].

The lower prevalence recorded in this study could be due to the study period, dry season. The absence of a suitable habitat for breeding of the snails and development of the parasites. In dry seasons, snails are forced to undergo aestivation deep in the mud in search of moisture. Only those snails in permanent water source have the opportunity to shed cercariae and hence low prevalence rate in dry season [23, 24].

In the current abattoir survey, out of a total of 53 livers examined, 13.2% (7) were infected by one or more *Fasciola* species. *Fasciola hepatica* was found to be the most prevalent species in the study accounting for 57.5% where as *F. gigantica*, mixed and immature or unidentified forms of *Fasciola* species were found to be 23.3%, 13.3% and 5.83% respectively during necropsy examination. Consistent to our findings, abattoir surveys in different parts of Ethiopia reported the predominance of *F. hepatica* over *F. gigantica* [20, 21, 25, 26]. This might be associated with the existence of favorable ecological conditions for *lymnea truncatula*, the intermediate host for *F. hepatica* [14]. In Ethiopia, *F. gigantic* is found at altitudes below 1800 m.a.s.l. while *F. hepatica* is found at altitude between 1200-2560 m.a.s.l and mixed infections by the two species can be encountered at 1200-1800 m.a.s.l. [27].

The adult animal was frequently affected compared to the young. As to the prevalence rates on sex basis, prevalence rates of 19 (13.0%) and 27 (11.3%) in males and females were observed respectively. Nevertheless, there was significant variation prevalence rate of fasciolosis among the origin of the animal. The highest prevalence rate was observed in kossa peasant association (21.9%) followed by kocha association (14.6%) and butta hora (13.0%).The result might be due to favorable the ecological condition (marshy area) which, all the three peasant association, is commonly shared. Flood prone areas and low lying marshy and drainage ditches are ideal for breeding of *Lymnea truncatula* [23].

Body condition wise analysis, statistically significant variation ($P<0.05$) on the prevalence of fasciolosis was observed. Poor body condition cattle were more susceptible than good body condition cattle with prevalence of 18.2% and 7.8%.As the body condition increases, infection with fasciola decreases because fasciola is known to suck blood and tissue fluid and even damage the parenchyma of the liver (Immature Fasciola) which ultimately depletes protein from the host [28]. Moreover liver cirrosis induced in chronic fasciolosis could reduce bile output and flow to the duodenum and hence reduced lipid emulsification, digestion and absorption of fatty acid and lipid soluble vitamins.

Finally, the economic loss due to liver condemnation considered as direct economic loss because all affected liver with fasciolosis were totally condemned. It is significant loss in local economy and revenue due to condemned livers even it may hinder the government development and transformation policy further.

CONCLUSION

Faciola is one of the major parasite infection of bovine in the study area. The level of infection observed in this study suggests the existence of favourable climatic conditions throughout the year for the development and survival of the parasite in the area of origin of the studied animal due to the water lodgement from Shewa-banch and Shishida River. Cattle with poor body condition were found highly infected by fasciolosis than cattle with good body condition. Female cattle highly infected than Male cattle of the prevalence fasciolosis. Age wise, however, adult were found to be highly infected than their younger counterpart. The most prevalent fasciola species obtained in condemned livers was *F. hepatica* in Chena abattoir coming from different origins. There was substantial agreement between faecal examination and liver inspection in the diagnosis of fasciolosis. The financial

loss related with the condemnation of Fasciola infected liver at the abattoir also indicated the economic importance of fasciolosis in the study. It is therefore concluded that fasciolosis causing significant losses to farmers, butchers and consumers. Based on the findings of this study the following recommendations are forwarded

- ✓ Strategic use of antihelmenthic should be performed to reduced pasture contamination with fluke eggs.
- ✓ Snail control should be conducted to reduce magnitude of problem.
- ✓ Creating and further consolidating of farmer's awareness is necessary.

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