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Prevalence of Bovine Fasciolosis in Ilu District, South Western Shoa, Ethiopia

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Abstract: A cross sectional study aimed at determining the prevalence, risk factors and type of common *Fasciola* species in cattle was conducted in Ilu District from April to November 2017 by using post-mortem inspection and coprological examination. Out of 384 livers inspected, 126 (32.8%) were positive for *Fasciola* species. *Fasciola hepatica* was found to be the most prevalent species in cattle of the study area (77%) whereas *F. gigantica* accounted for 14.3% of 126 infected livers and 8.7% were unidentified immature flukes. Prevalence of 22.4% and 56.3% were observed in animals of good body condition and medium body condition, respectively. The prevalence of Fasciolosis in adult and old cattle, were (25.5%) and (18.4%) respectively. Likewise, out of 384 faecal samples examined 81 (21.1%) were positive for *Fasciola* eggs. The prevalence of Fasciolosis was different in the study areas and the highest prevalence was observed in Mulosatayi (26.6%) followed by Jidumida (24.2%), Bili (17.6%) and Teji 01 (16.4%). In view of the current result, Fasciolosis could be considered as a major problem in Ilu district and as the ecological factors and management conditions are suitable both for the snail intermediate host and the parasite to be maintained.

Key words: Abattoir · Bovine · Coprology · *Fasciola* · Prevalence

INTRODUCTION

Ethiopia has the largest livestock population in sub-Saharan Africa, with an estimated population of 52 million cattle, 25.5 million sheep and nearly 24 million goats. Cattle are most economically important livestock species with high estimated population and the majority are indigenous zebu breed. Ethiopia fails to optimally exploit these resources due to a number of factors such as recurrent drought, infrastructure problem, rampant animal diseases, poor nutrition, poor husbandry practices, shortage of trained man power and lack of government policies for disease prevention and control [1]. Parasitism represents a major obstacle to the development of sub-sector especially Fasciolosis caused by *Fasciola hepatica* and *Fasciola gigantica*, is one of the most prevalent helminthic infections of ruminants in different parts of the world inducing significant morbidity and mortality [2] and can cause significant economic losses in African livestock [3].

Bovine Fasciolosis is one of the most important parasitic diseases of cattle causing mortality and production losses in various parts of Ethiopia. Fasciolosis is the priority disease in the highland as well as in lowland areas of the country [4]. The members of this genus are commonly known as liver flukes. *Fasciola hepatica* and *F. gigantica* are the two liver flukes commonly reported to cause Fasciolosis in ruminants and they are responsible for widespread mortality and morbidity in cattle characterized by weight loss, anaemia and hypoproteinemia [5].

The complex nature of the life cycle and epidemiology of this snail-borne disease presents challenge for predictive mapping at the herd level, as well as disease management and animal husbandry at the individual level [6]. Fasciola gigantica and *F. hepatica* can infect a wide variety of domesticated animals, wildlife and people In addition, Fasciolosis is now recognized as an emerging human disease [7]. Thus the disease endemic zone can be difficult to define from parasitological data alone and so consideration of the distribution of associated snail intermediate hosts can be important [8]. Although it may take place at any time of the year, infection is most prevalent during autumn in temperate areas, with the resultant effects of disease becoming apparent in winter and spring [9].

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Fasciola hepatica has a cosmopolitan distribution, mainly in temperate zones including Ethiopia and infects cattle and other mammalian species and is endemic in many parts of the world. On the other hand F. gigantica is the most common liver fluke in sub-Saharan Africa and Asia being adapted to warmer conditions likely due to the widespread distribution of its intermediate host Lymnaea (Radix) natalensis [10]. Thus, the two *Fasciola* species overlap in many African and Asian countries and sometimes in the same country, although in such cases the ecological requirements of the flukes and their snail intermediate host are distinct [11].

In Ethiopia, the prevalence of bovine Fasciolosis has shown to range from 11.5% to 87%. *Fasciola hepatica* was shown to be the most important fluke species in Ethiopian livestock with distribution over three quarter of the nation except in the arid northeast and east 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 land mass [12].

The disease is found in vast water lodged and marshy grazing field condition anticipated to be ideal for the propagation and maintenance of high prevalence of Fasciolosis. In Ethiopia, the highlands contain pockets of water logged marshy areas. These provide suitable habitats year round for the snail intermediate hosts [4]. Diagnosis is based primarily on clinical signs, seasonal occurrence, previous history of Fasciolosis in the area or the identification of snail habitats; post-mortem examination and examination of faeces for fluke eggs. Even though, it is possible to detect *Fasciola* egg in live animals, through faecal examination, liver examination at slaughter or necropsy was found to be the most direct reliable and cost effective technique for the diagnosis of Fasciolosis [13].

Though the problem due to Fasciolosis was reported from different parts of the country, information on the current status from different locations need to be attained. This study aims to fill such gap and hence been carried out in cattle in Ilu district. Therefore, the objectives of this study were to determine the prevalence of bovine Fasciolosis, in cattle in Ilu district Oromia regional state.

MATERIALS AND METHODS

Study Area: The study was conducted in Ilu District, from April 2017 to November 2017. Ilu is located in south western part of Oromia in the South West Shoa Zone of the Oromia Regional Administration, 55km South West of Addis Ababa. Geographically Ilu District is located at, latitude of about 8°44'N and longitude of about 38°20'E Coordinates and an elevation of 1950 meter above sea level. Based on the 2005 national census conducted by central statistical authority of Ethiopia (CSA), this district has a total population of 66758, of that 33273 are men and 33, 485 are women [14]. In the study area indigenous breed of cattle are the major livestock with traditional crop livestock farms and some small holder farms. The climatic condition is characterized by warm and temperate. The rainy season of this area extends from April to September while the dry season extends from November to March. The study area receives a mean annual rainfall of about 21 mm which comes from the long and short rainy seasons. The average annual temperature during the study period is 23°C.

Study Animals: The study population were cattle of different ages and both sex categories brought from different parts of the study area to the veterinary clinic of the district for the purpose of treatment from different cases and then faecal sample was collected from cattle from four localities during the study period (Mulosatayi, Bili, Jidumida and Teji 01 villages). A total of 384 samples were collected to determine the prevalence of *Fasciola* from the four localities. All these animals were privately owned by small holder farmers and managed under traditional extensive system and depend mostly on communal grazing and receive a minimum or no supplementary feed and health care. Likewise, 384 liver samples were taken from animals presented to Teji Municipality Abattoir for the purpose of slaughter during the study period.

Study Design and Sample Size Determination: Cross-sectional study design was employed to estimate prevalence of *Fasciola* in live animals based on faecal examination for fluke egg and based on examination of liver of cattle slaughtered in the abattoir. Sample size required for this study was determined based on the expected prevalence (50%) of bovine Fasciolosis and the 5% desired absolute precision and 95% CI according to Thrusfield [15]. Accordingly, 384 cattle were sampled randomly for faecal examination and 384 livers of slaughtered cattle were inspected at Teji municipal abattoir.

Examination of Liver and Gall Bladder for *Fasciola* Infestation: Active abattoir survey was conducted during routine meat inspection on randomly selected cattle. During ante-mortem examination, detailed records about the breed, origin and body condition of the animals was performed. Livers were examined by visual inspection, palpation and systemic incision to appreciate the presence, size, burden and species of liver fluke and the intensity of liver lesion due to *Fasciola* infection. Liver was inspected by making multiple deep incisions of the lobes and making a deep cut with a number of small sub cuts. Gall bladder was also opened using a knife and thoroughly investigated for the presence of *Fasciola* [16].

Coprological Examination: Microscopic examination of faecal samples collected directly from the rectum of live animals was conducted using direct sedimentation technique at Teji veterinary clinic for the presence of characteristic *Fasciola* eggs [17]. Breed, age and geographical location of the animal were also recorded. Convenient sampling technique was the sampling design strategy used to collect all the necessary data.

Data Analysis: Data from the post-mortem examination and laboratory findings were entered in to Microsoft Excel spread sheet and analysed using SPSS version-20 statistical software. The data were analysed by chi-square test to determine the significance of the variation in prevalence rates between age, sex, breed and origin. Prevalence of bovine Fasciolosis was expressed as percentage by dividing number of samples or animals positive to adult *Fasciola* or *Fasciola* eggs to the total number of samples or the total number of animals' examined [18]. A 95% confidence interval and 5% significance level were used to determine whether there was significant difference in the measured parameters.

RESULTS

Out of the total 384, indigenous and cross breed cattle slaughtered and examined in the study period from April 2017 to November 2017 at Teji municipal abattoir, 126 (32.8%) were found to be positive for *Fasciola* species. Out of the 126 livers found positive for *Fasciola* infection during post-mortem inspection of slaughtered cattle, 97 (77%) liver harboured *Fasciola hepatica*, 18 (14.29%) liver infected with *Fasciola gigantica* and unidentified immature fluke is 11(8.71%) (Table1). The highest Fasciolosis prevalence was recorded in animals with medium body condition (56.3%) and followed by good body condition (22.3%) and no animal with poor body condition was slaughtered in Teji municipal abattoir during study period as shown in Table 1.

From the total of 384 cattle faecal samples examined, 81(21.1%) were positive for *Fasciola* eggs. The study was conducted to quantify the prevalence of *Fasciola* in cattle, the animal considered to be positive for Fasciolosis when faecal sample examined was positive for Fasciola egg. All animals examined for *Fasciola* originated from four Villages namely: Bili, Jidumida, Mulosatayi and Teji 01; among these villages the highest prevalence 26.6% (25 of 94) was obtained in Mulosatayi, while the lowest prevalence, 17.6% (15 of 85) was from Bili (Table 2).

Table 1: Prevalence of Fasciolosis in slaughtered cattle at Teji municipal abattoir based on age, breed and body condition

	Age		Breed		Body condition			Species found		
Category	Adult	Old	Cross	Local	Good	Medium	Over all	*F. hepatica*	*F. gigantica*	Immature
Examined	133	251	27	357	265	119	384			
Positive	82	44	5	121	59	67	126	97	18	11
Prevalence	61.7	38.3	18.5	33.7	22.3	56.3	32.8	77	14.29	8.71
p-value	0.467		0.386		0.565					

Table 2: Prevalence of bovine Fasciolosis in live cattle on location, age and sex and body condition basis.

	Body condition			Sex		Age			Location			
Category	Poor	Medium	Good	Female	Male	Young	Adult	Old	Teji	Bili	J/M	M/S
Examined	167	157	60	145	239	62	235	87	110	85	95	94
Positive	45	33	14	23	58	5	60	16	18	15	23	25
Prevalence	26.9	21	23.3	15.7	24.3	8.1	25.5	18.4	16.4	17.6	24.2	26.6
p-value	0.57			0.982		0.167			0.81			

J/M=Jidumida, M/S=Mulosatayi

Prevalence of bovine Fasciolosis based on age categorized in to three, young (below 2 years old), adult (2 to 7 years old) and old above 7 years old. Out of the total 384 animals examined, comparison of prevalence of *Fasciola* infection between three age groups the highest prevalence rate of Fasciolosis is 25.5% (60 of 235) was observed in grouped in the age category between two and seven (adult) while the lowest prevalence rate 8.1% (5 of 62) was observed in cattle grouped less than two years (young) and 18.4% (16 of 87) was detected in old age (>7years) category as shown on Table 2. Sex of cattle tested as a risk factor for Fasciolosis; different level of prevalence 24.3 % (58 of 239) and 15.7% (23 of 145) was detected in male and female cattle respectively as shown in Table 2. From the total cattle examined higher number of Fasciola prevalence 26.9%(45 of 167) was obtained in cattle having poor body condition, followed by good 23.3% (14 of 60) and medium 21%(33 of 157) body condition respectively (Table 2).

DISCUSSION

Although there is low agreement between the Coprological method and post-mortem examination, the result of this study confirmed existence of Fasciolosis in Ilu district. The abattoir prevalence of Fasciolosis obtained from this study is 32.8%. This result is higher when compared with the prevalence (14%) at Soddo [19] and (28.63%) at Hawassa [20] but it is lower than (90.65%) reported from Gondar abattoir [21] and (46.58%) Jimma abattoir [12]. This great variability shown is probably due to the ecological and climatic differences between different locations throughout the country. Of the most important factors that influence the occurrence of Fasciolosis in an area is the availability of a suitable habitat for the vectors, variations in the ecological and climatic conditions such as altitude, rainfall and temperature, although differences in livestock management system and the ability of the inspector to detect the infection may play a role [13].

Both species of *Fasciola* were identified during the study period; however, *F. hepatica* was the most prevalent (77%). Relatively small proportions of cattle were found infected with *F. gigantica* alone. In support of the present study, the report of Gebretsadik *et al.* [22] was 56.4% of cattle were infested with *F. hepatica* and 9.2% with *F. gigantica*. This may be explained by the fact that most cattle for slaughter came from high land and middle altitude zones. The high prevalence rate of *F. hepatica* may be associated with the existence of favourable ecological biotopes for *L. truncatula*. In addition, optimal base temperatures of above 10°C and 16°C are necessary for the vectors of *F. hepatica* and *F. gigantica*, respectively and for the development of *Fasciola* species within the snails. Optimal moisture for snail breeding and development of larval stages within the snails is provided when rainfall exceeds transpiration and saturation is attained. Such conditions are also essential for the development of fluke eggs, miracidiae searching for snails and dispersal of cercariae [13]. However this finding was not in agreement with the finding of Abuna *et al.* [19] with the highest prevalence of *Fasciola gigantica* in Soddo municipal abattoir.

Since acquired immunity is crucial in influencing the severity of Fasciolosis [22] young animals with weak and less developed immunity was more likely to be affected by Fasciolosis than older animals in which acquired immunity was well developed. Breed and age results indicate that there was no statistically significant variation ($p>0.05$) observed between animals having young, adult and old age and local and cross breed with regard to occurrence of infection [23].

The overall prevalence of bovine Fasciolosis in the present study was lower than the previous findings of 50.98% by Dagne [24]. The variation in overall prevalence of bovine Fasciolosis among different areas of the study may depend on some factors such as, snail population, 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 [25].

The result of coprological examination is higher than 4.9% recorded in Soddo [19] and much lower than 80% recorded for Debre Berhan [24] which is the high land of Ethiopia, (37.2%) in Mecha and Fogera [4] and (33.42%) in Gondar [21].

Infection rates of bovine Fasciolosis at the level of villages of the study area revealed that there is no significant difference ($p>0.05$) among the different localities with respect to the prevalence of *Fasciola* eggs. This could be attributed to the similarity of agro-ecological conditions such as altitude, rainfall and temperature favouring the development of intermediate hosts and the parasite stages. In this study, no significant variation ($P>0.05$) was revealed in the prevalence of *Fasciola* between different age and sex groups. This finding does not agree with the works of Woldemariam and Wossene [4], Jobre and Ali [21]. This indicates that there is no difference in acquiring *Fasciola* infection between young, adult and old as well as male and female

animals. This might be due to common exposure to a similar *Fasciola* contaminated pasture land by both age and sex groups and traditionally animals are driven to pasture regardless of sex age [26, 27].

The prevalence of Fasciolosis found in the study was higher by post mortem finding than coprological examination. Despite there is difference between the results of coprological and post-mortem inspection, it ought to be noted that post mortem methods have higher specificity making them superior over other test systems [10]. In addition, coprological screening is labour intensive and is prone to errors including the possibility to misdiagnose eggs of other trematode species as those for Fasciola species.This may be attributed mainly to the fact that Fasciola eggs only appear in faeces 8-15 weeks post infection, so most of pathological lesions had already occurred [22, 28].

CONCLUSSION

In the present study moderate prevalence of bovine Fasciolosis was obtained when compared with prevalence reported by different researchers at different area. Generally from various points of view considering the prevalence of the disease and its economic significance in different parts of the nations, one can strongly conclude that Fasciolosis is one of the important livestock parasitic diseases, especially of cattle which impose huge impact to farmers. In order to reduce these losses, strategic anthelmintic treatment with appropriate fluckicide drug should be practiced and a combination of control measures include; avoiding animals grazing from marshy land, drainage, fencing and molluscides have to be used to ensure a satisfactory degree of control in the long run. Finally, the farmers should be educated and informed about the importance of the disease control programs and regular deworming of animals before and just after rainy season. In addition to this government must pay attention for livestock sector to control such economically significant diseases in order to enhance economic development of the country.

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