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Prevalence and Associated Risk Factors of Bovine Fasciolosis in and Around Agena District Abattoir, Gurage, Central Ethiopia

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Abstract

A cross sectional study aimed at determining the prevalence and type of common *Fasciola* species in cattle was conducted in and around Agena from November 2016- March 2017. The study was based on post-mortem inspection of livers of slaughtered animals at Agena municipality abattoir. Out of 384 livers inspected, 124 (32.29%) were positive for *Fasciola* species. *F. hepatica* was found to be the most prevalent species in cattle of the study area (59.68%). About 23.39% were positive for *F. gigantica* and 16.93% were harboring mixed infections.In view of the current result, fasciolosis could be considered as a major problem in Agena and surrounding areas as the ecological factors and management conditions are suitable both for the snail intermediate host and the parasite to be maintained. Strategic treatments need to be implemented at appropriate timing with the aim of reducing worm burden from infected animals and preclude pasture contamination. Integrated control approaches involving livestock owners has to be implemented in reducing the population and activity of snail intermediate hosts to enable maximization of long-term returns from such endemic areas.

Keywords: Agena, Fasciolosis, Prevalence

1. Introduction

Ethiopia has the largest livestock population in Africa, with a total cattle population of 57.83 million (CSA, 2016). In spite of the presence of huge ruminant population, Ethiopia fails to optimally exploit resources due to a number of factors such as diseases, poor nutrition, poor husbandry practices and lack of government policies for disease prevention and control (ILRI, 2009). Among the animal diseases that hinder the animal health are parasitic infections that have great economic impact (Abdulhakim and Addis, 2012).

Among many parasitic problems of farm animals, fasciolosis is a major disease which imposes economic impact on livestock production particularly of cattle and sheep (Yusuf *et al*., 2016). *Fasciola hepatica* and *Fasciola gigantica*

are the two liver flukes commonly reported to cause fasciolosis in cattle. The life cycles of these parasites require snail as an intermediate host (Walker, 2008). *Fasciola* hepatica has a worldwide distribution but predominates in temperate zones while F. gigantic is found on most continents, primarily in tropical regions (Wamae, 1998).

Fasciolosis is associated with liver damage and hemorrhage due to migration of flukes through the liver parenchyma. There is also haematophagic activity of the adult flukes anddamage to the bile duct mucosa by their cuticular spines due to fluke residence in the bile duct (Taylor *et al.*, 2007; Urquhart *et al*., 1996). Diagnosis of fasciolosis may be established based on the epidemiology of the disease, observations of clinical signs, and information on grazing history (Kassai, 1999). However, confirmatory diagnosis is based on coproscopic examination in the laboratory and post-mortem examination of infected animals by the detection of flukes in the liver (Slos*set al*., 1994). The treatment of fasciolosis, should be focused on the juveniles and adult fluke. In general Triclabendazole is effective against all developing stages over one week old. Moreover reduction of snail population is important measure in the control and prevention strategies (Radostits*et al*., 2007).

The geographic distribution of Fasciola species is dependent on the distribution of suitable species of snails such as *Lymnaenatalensis* and *Lymnaetruncatula*, the most common intermediate hosts and usually associated with herds and flocks grazing wet marshy land area. Both Lymnae species are needed for the parasite s life cycle to be completed (Brown, 2005).

In the Ethiopian highlands, fasciolosis is also major health problem and causes production losses in domestic ruminants. Highland regions of the country contain pockets of waterlogged marshy areas that provide suitable habitats year round for the snail intermediate hosts (Brook *et al*., 1985). Both *F. hepatica* (high land) and *F. gigantica* (low land) type of liver flukes cause severe losses in Ethiopia where suitable ecological conditions for the growth and multiplication of intermediate host snails are available (Anne and Gary, 2006).

The prevalence of the disease is known to be relatively high causing considerable economic losses in livestock production (Baharu, 1997). The areas around Agena and peasant association areas are generally considered as one of the most affected and endemic area of fasciolosis in the country region, Veterinary practitioners and animals owners complain of huge annual losses from it. However, there are practically no dependable detailed studies that have been conducted on the prevalence the monthly/seasonal variations in the prevalence rates of the disease and other related parameters so as to design relevant control strategies that can be implemented against the disease in the area. The information regarding the prevalence and associated risk factors of bovine fasciolosis in Agena area is scanty.

Therefore, the aim of this study is to determine the prevalence and associated risk factors of trematode infections identify the fluke burden and species identification in particular positive livers, and determination of the liver pathology (Lesion) in cattle owned by smallholder farmers located in and around Agena area, south western Ethiopia.

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted in and around Agena Municipal abattoir of Edjaworeda, Central Ethiopia, which is located 197 kms south west of Addis Ababa. It lies in an altitude range of 2000-2200 meter above sea level. The average temperature ranges of the year ranges from 11-24°C. The total annual rainfall is 579 mm-650 mm. The weather condition is hot and humid. The livestock population of the area includes a total of 36,516 cattle; 8,442 shoats; 800 horses; 200 mule; 3,080 donkey; 100 camel; 53,796 poultry.

2.2. Study Animals and Sampling Technique

Study population comprises of indigenous (local) breed of animals of different age, sex, body conditions and origin category found under the extensive grazing system. In the abattoir study male indigenous animals were provided for slaughter from different localities in the Edjaworeda, Central part of Ethiopia. Simple random sampling technique was the sampling strategy used to collect all the necessary data from fecal samples and abattoir survey of the study animals.

2.3. Sample Size Determination

Since there was no previous study in Agena and around peasant association to establish the prevalence, associated risk factors, fluke burden and species identification in of bovine fasciolosis, the sample size was determined by taking the prevalence of 50% and 5% absolute precision fasciolosis using the formula given by (Thrusfield, 2005). Accordingly, 384 animals were supposed to be sampled.

2.4. Study Design

A cross-sectional investigation of the prevalence of bovine fasciolosis in the six peasant association in and around Agena was carried out from November 2016 to November 2017.

2.5. Abattoir Study

Active abattoir survey was conducted based on cross sectional study during routine meat inspection on randomly selected cattle slaughtered at Agena municipal abattoir. During ante-mortem examination detail records about the age, sexes, origins and body conditions of the animals were performed. During post-mortem inspection, each liver visually inspected, palpated and incised based on routine meat inspection by (Soulsby, 1986). All livers having *Fasciola*species condemned were registered and flukes were conducted for species identification as described by (Ogurinide and Ogurinide, 1980). Hepatic lesions in *Fasciola* positive livers were further grouped into lightly, moderately and severe affected base on the severity of damage inflicted by the parasite. The task of categorization was performed based on the criteria forwarded by Richard (1993).

2.5.1. Fasciola Species Identification

After collecting the flukes in the universal bottle containing 5% formalin as a preservative, *Fasciola* species were easily identified based on morphological characters such as shape, size. They were classified as *Fasciola hepatica* (relatively small sized), *Fasciola gigantica* (relatively large sized and more leaf like), mixed forms (*Fasciola hepatica and Fasciola gigantica*) and undifferentiated or immature forms of *Fasciola* species (Urquhart *et al*.,1996).

2.5.2. Types of Infection

The types of infection are classified as *Fasciola hepatica, Fasciola gigantica*, mixed *Fasciola* species (*Fasciola hepatica, Fasciola gigantica*) and juveniles.

2.6. Body Condition Scoring

Body condition of the study animals was scored based on the criteria set by Mihrete *et al*., (2010) which ranged from 0 to 5. Body condition score 0 stands for cows with the poorest body condition while score 5 for cows with the best condition. All cattle under the study their body condition grouped into three groups poor (score 0-1), medium (score 2-3) and good (score 4-5).

2.7. Statistical Analysis

The recorded data were entered in to Microsoft excel data base system to be analyzed using SPSS version 21 statistical software. Descriptive statistics was computed. Pearson's chi square (X^2) was used to evaluate the association between the prevalence of fasciolosis and different factors. A 95% confidence interval and P-value less than 0.05 (at 5% level of significance) were considered significant in all analysis.

3. Results

A total of 384 local and cross cattle breeds that slaughtered at Agena municipal abattoir were examined for the presence of fasciolosis. Among the examined animals, 124 (32.29%) were positive for fasciolosis. Out of 124 livers positive for fasciolosis, 74 livers (59.68%) harbored *Fasciolahepatica*, 29 (23.39%) harbored *Fasciolagigantica* and the remaining 21 livers (16.93%) harbored mixed infection of *Fasciola* (Table 1).

Table 1: Prevalence of fasciolosis in slaughtered cattle by fluke species

Species of Fasciola	Number of positive livers	Prevalence (%)
F. hepatica	74	59.68
F. gigantica	29	23.39
Mixed infection	21	16.93
Total	**124**	**100**

Out of 119, 142 and 123 cattle examined in Yesray, Yegobet and Shebraden, 33(27.73%), 39 (26.76%) and 53(43.09%) were found to be positive for fasciolosis, respectively. There was statistically significant (P = 0.008) association in prevalence of fasciolosis among different study location of cattle examined (Table 2). There was a statistically significant difference (p = 0.042) in the prevalence of bovine fasciolosis between breed groups. The highest 116(34.02%) prevalence was in local breed animals and the lowest 8(18.6%) was found in cross breed animals (Table 2).

As the shown in Table 2, from the total of 370 male and 14 female cattle examined, 121 (32.7%) and 3 (21.4%) were positive for fasciolosis, respectively. There was no significant association (p = 0.376) between prevalence of fasciolosis and sex of study animals. There was a statistically significant difference (p = 0.0056) in the prevalence of bovine fasciolosis in different age groups considered. The highest 19(52.78%) prevalence was in young animals and the lowest 105(30.17%) was found in adult animals. The prevalence of fasciolosis has only significantly associated with body condition of the cattle (p = 0.00039).The highest 39(51.31%) prevalence was in poor conditioned animals and the lowest 37(27.2%) was found in good conditioned animals.

Table 2: The effect of risk factors on the occurrence of fasciolosis

Risk factors	Examined	Positive	Prevalence	Chi square (X2)	P-value
Origin					
Yesray	119	33	27.73%	9.678	0.008
Yegobet	142	39	26.76%		
Shebraden	123	53	43.09%		
Breed					
Local	341	116	34.02%	4.149	0.042
Cross	43	8	18.6%		
Sex					
Male	370	121	32.7%	0.79	0.376
Female	14	3	21.4%		
Age					
Young	36	19	52.78%	7.62	0.0056
Adult	348	105	30.17%		

Body condition					
Poor	76	39	51.31%	15.7	0.00039
Medium	172	48	27.9%		
Good	136	37	27.2%		

4. Discussions

The overall prevalence of bovine fasciolosis (32.29%) observed in this study is in close agreement with the report of Berhe*et al*., (2009) from northern Ethiopia, who reported a 24.3% prevalence. However, it is much lower than that of many other studies from different abattoirs in the country and elsewhere in Africa. Yilma and Mesfin (2000) reported a 90.7% prevalence of fasciolosis in cattle slaughtered at Gondar abattoir, while Tolosa and Tigre (2007) recorded a prevalence of 46.2% at Jimma abattoir. Phiri*et al*., (2005) from Zambia and Pfukenyi and Mukaratirwa (2004) from Zimbabwe reported 53.9 and 31.7% prevalence, respectively. On the other hand, a lower prevalence of fasciolosis (14.0%) has been observed in slaughtered cattle at Wolaita Soddo abattoir (Abunna *et al*., 2009). However, the prevalence of fasciolosis recorded in this study is higher than that reported in Diredawa municipal abattoir (14.4%) (Daniel, 1995). Difference in prevalence among geographical locations is attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature. *Fasciola* spp. prevalence has been reported to vary over the years mainly due to variation in amount and pattern of rainfall.

The result of present study revealed that the sex of the animal has significant effect ($p < 0.05$) on the occurrence of bovine fasciolosis. This disagrees with the report of Rahamato*et al*., (2009) who concluded that sex has no impact on the infection rate and hence both male and female are equally susceptible and exposed to fasciolosis. But this contradicts with the work of Balock and Arthur (1985) who reported that the effect of sex on the prevalence of bovine fasciolosis might be attributed to management system, with longer exposure of male outdoor when females are kept indoor at beginning of lactation.

The result of present study showed that age has significant effect on the prevalence of bovine fasciolosis; being higher in young animals than the adult ($p < 0.05$). There was a decrease in infection rate (prevalence) as age increased. This may be due to the result of acquired immunity with age which is manifested by humoral immune response and tissue reaction in bovine liver dueto previous challenge. There are some additional reports confirming that the increased resistance against fasciolosis (low prevalence) with age is most likely related to the high level of tissue reaction seen in bovine liver. Liver fibrosis which impedes the passage of immature flukes acquired thickening, stenosis and calcification of bile ducts, assumed unfavorable site for adult parasites and consequently fasten their expulsion. These are in agreement with experimental study conducted by Radostits*et al*., (1994) which confirmed the occurrence of higher infection rate in younger animals.

The results of the present study indicated that body condition of the animal has significant association with the occurrence of fasciolosis. The prevalence was higher in poor body conditioned animals than that of medium and good body conditioned animals. The prevalence of fasciolosis was higher in the animals with poor body condition because this body condition in cattle is manifested when fasciolosis reaches at its chronic stage. Post mortem examination on the 124*Fasciola* infected livers of current results indicated that the prevalence of *F. hepatica* (59.68%) was higher than that of *F. gigantica* (23.39%). The high prevalence of F. hepatica may be associated with the presence of favorable ecological biotypes for its snail vector *Lymnaea truncatula.*

5. Conclusion and Recommendations

In general fasciolosis was found prevalent in the study areas. This will be a hindrance to the livestock production by causing remarkable direct or indirect losses in the study areas. Moreover, the study area is suitable for the survival of the snail which worsened the situation for the future. Therefore, strategic application of fluckicide and avoiding animals grazing from marshy land plays considerable success for the control of fasciolosis in these study areas.

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