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Abattoir Survey on Prevalence of Bovine Fasciolosis in Guduru and Abay Chomaan Districts

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Abstract: A cross sectional study was conducted from April, 2014 to December, 2014 with the aim of determining the prevalence of bovine *fasciolosis* and its risk factors in Abaychoman and Guduru municipal abattoir. A post mortem examination was used as diagnostic tool for this research to detect adult liver fluke found in the bile ducts of slaughtered animals. Parasites were identified into species level by using standard parasitological techniques. Following post-mortem examination, a total of 384 indigenous cattle slaughtered during the study period were considered and 125(32.6%) were found to be positive for one or both of the *Fasciola* species. Out of this positive samples; *F.gigantica* was prevalent (47.2%) when compared to *F. hepatica* (39.2%) or mixed infections (13.6 %). In this study, different variables such as body condition, origin, sex and age were considered. Accordingly, the prevalence of the parasites in different body conditions was found to be: 60% (135) in poor, 23.5% (170) in medium and 5.1% (79) in good body conditioned animals and was statistical significant (P=0.000). The infection rates in different origins of animals were also analyzed and a prevalence of 28.5% (179) and 36% (205) was recorded in Abaychomen and Guduru respectively. Based on the sexes of animal slaughtered, the prevalence rate of bovine *fasciolosis* in male was 34.3% (216) and in female 30.4% (168). The risk factors such as origin of animals and sex were not statistically significant. The prevalence of fasciolosis in different age groups of animals slaughter in both abattoirs was compared and found to be 15.3% (131) in young and 41.5% (253) in adult animals and it was statistically significant (P=0.00). Univariate logistic regression analysis of ages of animals confirmed that the probability of old animals to be infected by fasciolosis was 3.9 times higher when compared to young animals (OR=3.9; CI= 2.29; 6.74). Finally, the abattoir based prevalence recorded in this study area suggests that a detailed epidemiological study as well as assessment of the overall economic loss incurred due to fasciolosis is required to implement systematic disease prevention and control methods in the study area.

Key words: Abattoir · Bovine · Fasciolosis · Prevalence · Abaychomen · Guduru

INTRODUCTION

Livestock are an important component of nearly all farming systems in Ethiopia and provide draught power, milk, meat, manure, hides, skins and other products (Funk *et al.,* 2012). Currently, the population of livestock found in Ethiopia is estimated to be 53.4 million cattle, 25.5 million sheep and 22.78 million goats (CSA 2011). Though, Ethiopia has substantial livestock resources, its level of productivity is low due to constraints of disease. Out of these diseases; Fasciolosis is a major disease which imposes direct and indirect economic impact on livestock production, particularly of sheep and cattle (keyyu *et al.*, 2005*;* Menkir *et al*., 2007)[1-20].

The two most important species of this genus are *Fasciola hepatica* and *Fasciola gigantica* and are commonly known as liver fluke (Urquhart *et al,* 1996). Fasciolosis caused by *Fasciola hepatica* and *Fasciola gigantica* is one of the most prevalent helminthes infections of ruminants in different parts of the world. It

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causes significant morbidity and mortality. Both the high land (*Fasciola hepatica*) and the low land (*Fasciola gigantica*) types of live flukes cause severe losses in many parts of Ethiopia where suitable ecological conditions for the growth and multiplication of intermediate host (snails) are found. Areas (site) with seasonally flooded pastures grazing lakeshore, slowly flowing water ways and banks of rivers are among the conducive environment for breeding of snails vectors of fasciolosis (Abebe *et al*., 2007). The epidemiology of faciolosis is dependent on the ecology of snail´s intermediate host. There are many different species of *Lmynaea* but now generally agreed that two snail types are involved in the transmission of flukes, although there are species variant in different countries (Miodra and Lan Mclntyre, 1991). In case of *Fasciola hepatica* the most know intermediate host is *Lymnaea trancatula* of mud snail which prefers moist temperature conditions (15°C-22°C) though some variants found in tropics have adapted to higher temperature and can be breed and survive at 26°C with sufficient moisture during the season, *Lymnae truncatula* is capable of aestivation for at least a year in dry mud (Miodrag and Lan Mclntyre, 1996). The intermediate host for *F. gigantica* is *L. natalensis*. These are aquatic snail which prefers tropical or subtropical condition and thrive in well oxygenated non polluted water. There are however adaptable to an amphibious environment and can aestivate during day weather (Miodrag and Lan Mclntyre, 1996)[21-40].

Bovine fasciolosis is an economically important parasite disease of cattle caused by Fasciollidae family, trematodes of the genus *Fasciola*. The parasite imposes direct and indirect economic impact on livestock production and productivity; particularly of sheep and cattle (Keyyu *et al*., 2005; Menkir *et al.,* 2007). Infected cattle can exhibit poor weight gain and dairy cattle have lower milk yield and possibly metabolic diseases (Mason, 2004). For example, Kithuka *et al*. (2002) reported up to 0.26 million USD annual losses attributable to fasciolosis-associated liver condemnations in cattle slaughtered in Kenya. Another study conducted by Keyyu *et al.* (2006) reported up to 100% liver condemnation rates in some slaughter slabs in Iringa region in Tanzania due to liver flukes in cattle. Although a number of studies have been undertaken with regard to abattoir based prevalence and evaluation of the economic loss due to fasciolosis in different parts of Ethiopia (Tadele and Worku, 2007; Jibat *et al*., 2008; Fufa *et al*., 2009; Gebretsadik *et al*., 2009). Apart from its veterinary and economic importance throughout the world, fasciolosis has recently been shown to be a re-emerging and widespread zoonosis affecting many people (Esteban *et al.,* 2003). In spite of its higher incidence and economic importance of the parasite in different areas of the country, no research has been conducted in study area. Therefore, the objectives of this study were:

- To determine the prevalence of bovine fasciolosis and its associated risk factors in cattle slaughter in Guduru and Abay choman municipal Abattoir,
- To identify the fluke's species in local area.

MATERIALS AND METHODS

Study Area: The study was conducted in Guduru and Abay choman woreda municipal abattoirs. Guduru is located in Oromia regional state, Horo Guduru Wollega zone west of Addis Ababa, 288km far. The elevation of the area ranges from 1316-2430 meters above sea level. The area receives a mean annual rainfall of about 1100-1600mm.The annual mean temperature is 25^{0}c. The natural grasslands in the areas are traditionally used as grazing fields for livestock. The main grazing land in the area includes swampy area, forest margin, water lodged lands, mountain sides. The climatic condition of the area comprises 21% Kola and 79% Weynadegas. Abay choman werada is located in Oromia regional state, Horo Guduru Wollega zone west of Addis Ababa at a distance of 295km. The elevation ranges from 1316-2430 mean sea level. This area receives a mean annual rainfall of about 1300mm. The annual mean temperature is 26^{O}C. The weather condition shares 60% Bereha and 40% Weynadega. The farming system of both sites are mixed type where crop production and livestock rearing area done side by side. In study area majority of the animal kept by rural farmers are cattle and sheep and also some goats and equines. District covers areas of 820km with livestock population of Bovine 224, 192, Ovine 11,213, Caprine 12,666, Donkey 7,424, Horse 3,221, Mule 720 &Poultry 184,191.

Study Animals: The study animals were cattle of all age and sexes slaughtered in Guduru and Abay choman woreda municipal abattoir. It was difficult to precisely indicate the geographical origin of all animals slaughtered.

Sampling Method and Sample Size Determination: A systematic random sampling technique was used as sampling strategy to collect all the necessary data from abattoir survey of the study animals. The 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 (2005).

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

where:
n= is the required sample size
P_{exp}= is expected prevalence
d= is the level of precision (5%).

Accordingly, 384 animals were supposed to be sampled from both abattoirs.

Study Design and Sampling Methodology: A cross-sectional study was conducted from April 2014 to December 2014 with special attention to the livers of the slaughtered animals.

Post Mortem Inspection and *Fasciola* Species Identification: Post mortem examination of liver and associated bile duct was carefully performed by visualization and palpation of the entire organ followed by transverse incision of the organ across thin left lobe in order to confirm the case (Urquhart, 1996). Species identification of the recovered *Fasciola* was also conducted based on morphological features of the agents and classified in to *Fasciola hepatica*, *Fasciola gigantica* and unidentified or immature forms of liver fluke (Urquhart, 1996).

Data Analysis: All data were coded and entered to Microsoft excel and a preliminary analysis was done on it. STATA-12 (2005) was used to analyze the data. Univariate logistic regression analysis was conducted to see the association between the risk factors and the occurrence of the infection. Confidence interval and p-value was used to notice the presence of association and Odds Ratios was employed to assess the strength and direction of this association. The outcome variables considered were the adult *Fasciola* species detected during routine postmortem inspection. Descriptive statistics were carried out to summarize the prevalence of each parasite.

RESULTS

Out of the 384 indigenous cattle slaughtered at both Guduru and Abaychomen municipal abattoirs and examined for fasciolosis, 125 animals (liver) were found to be positive for one or both of the species of *Fasciola*. Hence, the overall abattoir based prevalence was 32.6% (95% confidence interval of (0.279-0.375). Of the 125 livers found to contain fluke infection during post mortem inspection, 49 (39.2%) harbored *F. hepatica*, 59 (47.2%) *F. gigantica*, 17 (13.6 %) had mixed infections (Table 1).

In this study, different variables such as body condition, origin, sex and age were considered. Accordingly, the prevalence of the parasites in different body conditions was found to be: 60% (135) in poor, 23.5% (170) in medium and 5.1% (79) in good body conditioned animals and the infection rate in different origins of animals were Abaychomen 28.5% (179) and Guduru 36% (205). Based on the sexes of animal slaughtered, the prevalence rate of bovine *fasciolosis* in male was 34.3% (216) and in female 30.4% (168). All the risk factors (origin of animals and sex), there were not statistically significant difference among them. The prevalence fasciolosis in different age groups of animals slaughter in both abattoirs was compared and found to be 15.3% (131) in young and 41.5% (253) in adult animals and it was statistically significant. This was performed using univariate logistic regression analysis and was found to be statistically significant (P=0.000). In addition to that, as animals age increased, the probability of infected by fasciolosis was 3.9 times higher when compared to young animals (OR=3.9; CI= 2.29; 6.74) (Table 2)[41-60].

Table 1: Prevalence of *Fasciola* species in cattle slaughtered at Guduru and Abaychomen municipal abattoirs (n=384)

Fasciola species	No of infected liver	Prevalence (%)
Fasciola hepatica	49	39.2
Fasciola gigantica	59	47.2
Mixed	17	13.6
Total	125	100

Table 2: Association between prevalence and risk factors based on post mortem findings at Guduru and Abaychomen municipal abattoirs

Variables	Positive	Negative	Total	Prevalence (%)	95% CI	P-value
Body condition						
Poor	81	5	135	60	0.51-0.68	0.000
Medium	40	130	170	23.5	0.17-0.30	
Good	4	75	79	5.1	0.01-0.12	
Origin						
Abaychomen	51	128	179	28.5	0.22-0.35	0.123
Guduru	74	131	205	36	0.29-0.43	
Sex						
Male	74	142	216	34.3	0.27-0.41	0.807
Female	51	117	168	30.4	0.23-0.37	
Age						
Young	20	111	131	15.3	0.09-0.22	0.000
Adults	105	148	253	41.5	0.35-0.47	

DISCUSSION

Bovine fasciolsis exists in almost all region of Ethiopia. However, the prevalence, epidemiology and *Fasciola* species prevailing in a given locality varied. This is mainly attributed to the variation in the climate and ecological condition such as altitude, rainfall and temperature and livestock management system (Graber, 1978). In the present study, the overall prevalence was found to be 32.6%. This result was in line with the findings of Mihreteab *et al*. (2010) which was reported to be 32.3%, however, it was significantly higher than the prevalence of bovine fasciolosis reported by Fufa *et al*. (2009) at Welaita Sodo (12.7%), at Soddo abattoir (4.9%), by Gebretsadik *et al.* (2009) at Mekelle (24.32%) and by Swai and Ulicky (2009) at Hawi, Tanzania (14.05%). This might be attributed to the variation in agro-ecological conditions which favors for the survival of both the parasite and the intermediate host. On the other hand, the prevalence of bovine fasciolosis in the present study was lower when compared with the previous reports in different parts of Ethiopia (Tadele and Worku, 2007) at Jimma (46.58%), in South Gondar (83.08%) and (Dagne,1994) in Debre Berhan (80%). The variation in climato-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).

In the present study, species identification revealed that *Fasciola gigantica* was more prevalent (47.2%) than *F. hepatica* (39.2%) and mixed infections (13.6 %). The higher prevalence of *Fasciola gigantica* might be associated with the existence of favorable ecological biotopes for the intermediate host *L. natalensis* and most of the animals may come from low land areas which are the preferable agro-ecology for the intermediate host, *L. natalensis* (Abebe *et al*., 2007). Unlike the present study, Gebretsadik *et al*. (2009) reported that 56.42% of cattle were infected with *Fasciola hepatica* and 9.17% with *Fasciola gigantica.* However, in another study, Fufa *et al.* (2009) stated that the most common liver fluke species affecting cattle at Welaita Sodo were *Fasciola gigantica.* Yilma and Malone (1998) indicated that *Fasciola gigantica* in Ethiopia is found at altitudes below 1800 meters above sea level. While *Fasciola hepatica* is found at altitude of 1200-2560 meters above sea level. Mixed infections by both species can be encountered at 1200-1800 meters above sea level. According to Yilma and Malone (1998), such discrepancy is attributed mainly to the variation in climatic and ecological conditions such as altitude, rainfall and temperature as well as livestock management system.

There was a statistically significant association between body conditions of the animals and the prevalence of *Fasciola* infection (P<0.05). In support of this finding, a study conducted in Mekelle (Yohannes, 2008) indicated that the association between the prevalence of fasciolosis and body condition of the animals was also statistically significant. Obviously, this could be due to the fact that animals with poor body condition are usually less resistant and are consequently susceptible to infectious diseases. Similar results were also reported by Abebe *et al*. (2011).

In the other way round, the presence of high prevalence of fasciolosis in animals with poor body condition may be due to the effect of the parasite in the animal as *Fasciola* species are blood and tissue fluid suckers and even damage the parenchyma of the liver (immature *Fasciola)* and cause*s* bleeding while the adult parasites are in the bile ducts, which ultimately deplete protein from the host (Urquhart *et al.,* 1996; Marquardt *et al*., 2000) which leads to poor body condition. Furthermore, cholangitis and liver cirrhosis might be caused by chronic fasciolosis and could reduce bile flow to the duodenum and hence reduced lipid emulsification, digestion and absorption of fatty acid and lipid soluble vitamins. It may also associate with the rationale that animals with poor body condition may have poor immunity and hence may be susceptible to any infectious diseases.

The infection rate fasciolosis in Abaychomen was 28.5% (179) and Guduru 36% (205). The presence of relatively high prevalence in Guduru 36% but absence of statistical variation in the prevalence of fasciolosis between the two origins of animals may be due to the similar in agroecology of the two study areas.

Regarding sexes based prevalence of bovine *fasciolosis* in slaughtered animal, was found to be relatively higher in males (34.3%) than in females (30.4%). This could be associated to the fact that male animals travel long distance for draught power and harvesting crops, this may lead to lowering immunity.

In the present study, out of all the variables considered (Body condition, origin of animals, sex and age); only body condition and age of animals were found to be statistically significant. Hence, as age increased, the prevalence of the disease was found to be increased, i.e., prevalence was found to be 41.5% in adult and 15.3% in young animals slaughter in both abattoirs. In addition to that, as animals age increased, the probability of infected by fasciolosis was 3.9 times higher when compared to young animals (OR=3.9; CI= 2.29; 6.74). This may associated with the fact that as age increased, the probability of exposure old animals to parasite (s) will be increased [61-75].

CONCLUSION

Fasciolosis is a major disease which imposes direct and indirect economic impact on livestock production, particularly of sheep and cattle in Ethiopia. Some of the economic losses in the cattle industry induced by fasciolosis are: mortality, liver condemnation, reduced production (meat, milk) and expenditures of anthelmentic for treatment, prevention and control. The present study was conducted at Abaychomen and Guduru municipal abattoir to determine the prevalence of fasciolosis and its associated risk factors. Out of the 384 indigenous cattle slaughtered and examined at both Guduru and Abaychomen municipal abattoirs, 125 (32.6%) of animals and their liver were found to be positive for one or both of the species of *Fasciola*. Of the 125 livers which were found to harbor liver flukes, 47.2% (59) were *F. gigantica* and 39.2% (49) were *F. hepatica* and the rest were mixed infections. In this study, different variables were considered, however, only body conditions and age were found to be statistically significant. According the present study, old animals were 3.9 times more prone to fasciolosis than young and animals slaughtered in Guduru municipal abattoir had a relatively higher prevalence (36%) than in Abaychomen (28.5%). Furthermore, male animals were susceptible for fasciolosis than females. Based on the above conclusions; the following recommendations are forwarded:

- The finding of present study strongly suggests for the need for appropriate and feasible control measures in study area,
- Community based control programs such as drainage of swampy area and fencing of watering points should be adopted in the area,
- If possible regular de-worming of animals before and after rainy season is warranted,
- Supplementation of important nutrient feed in dry season is important to avoid stress conditions that affect the host resistance and susceptibility to parasitic diseases,
- Further detailed epidemiological study as well as assessment of the overall economic loss incurred due to fasciolosis should be performed in the study area in order to expand and implement disease investigation and control strategy.

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