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Prevalence of Bovine Fasciolosis and Economic Significance in and Around Chora Wereda, Western Ethiopia

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Abstract: Study was conducted to determine prevalence of bovine fasciolosis and economic significance in and around chora wereda. Results of the study demonstrated that the occurrence of high prevalence of fasciola at the study area which includes about 216 (n=216) positive for fasciolosis at necropsy from total sample of 384 (n=384) slaughtered cattle with prevalence of 56.2%. Coprological finding on similarly sampled cattle with necropsy also strongly confirms occurrence of high prevalence which includes 209 (n=209) positive for fasciolosis from total of 384 (n=384) sample of slaughtered cattle with prevalence of 54.4%. The results also confirm that *Fasciola hepatica* is the most prevalent species with the prevalence rate of 20.6% while mixed fasciola infection is also commonly exist with the prevalence of 22.4% and other species *Fasciola gigantica* also exists with the prevalence of 13.3% alone. Among the considered risk factors age, body condition score and season of the study significantly affected the prevalence of fasciolosis ($p<0.05$). Adult cattle were mostly affected with prevalence of 38.8% than young's 17%, while poor and medium body condition cattle's were more susceptible with prevalence of 16.9% and 34% respectively than cattle's with good body condition score of 5% with significant differences ($p<0.05$). At wet season there is peak prevalence of 40.88% and 15.36% was detected at dry season with significant difference. Number of annually lost liver was estimated at about 5600 resulting 267,512 ETB/ year economic loss from each condemned liver due to fasciolosis.

Key words: Chora wereda · Bovine · Coprology · Economic significance · Fascilosis · Necropsy · Prevalence

INTRODUCTION

In the varied agro climatic zone of Ethiopia, ruminant livestock are important sources of income for rural and urban communities and are major sources of foreign currency from export. However, the rich potential from this livestock sector is not efficiently and fully exploited, due to several constraints like malnutrition, traditional management practice, poor genetic makeup and prevailing animal disease [1, 2]. Of the prevailing animal disease of the country trematode is one of main parasitic problem including fasciola in ruminants.

The phylum plathyhelminthes comprises of two of flat worms, trematoda and cestoda. Among the different families in the class trematoda fasciolosis is one of parasites involving ruminants [3].

Fasciolosis mainly affects domestic ruminants, which is caused by the liver fluke commonly known species *F. hepatica* and *F. gigantica*. They can also affect humans by consuming aquatic plants containing encysted organisms (Metacercaria) or by drinking contaminated water. The parasite can survive for more than 10 years in ruminants and humans, infection can also be acquired by consumption of raw liver containing immature liver flukes [4].

The parasite lives parts of its life in aquatic snails that act as intermediate host, which are found in and around wet areas such as water holes and water lodged areas [5].

Fasciolosis is more apparent in young cattle and is usually chronic in nature. Adult flukes in the bile ducts cause inflammation, biliary obstruction, distraction of liver tissue and anemia. In this regard, immature and adult

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flukes greatly affect the growth rate and feed conversion of young animals. In cows, there may be drop in milk production and reduction in consumption and pregnancy rate. Acute hepatic fasciolosis, mainly a condition in sheep, has been described in calves exposed to large number of cercaria which may lead to death [6].

In general, this common parasitic disease widely distributed to different geographical areas in the world including specified study area and fasciola is the most studied parasitic disease [7, 8]. Except some professional assessments performed for its occurrence there is no study conducted on prevalence, economic loss assessment and major risk factor associated with the parasite at the study site.

Therefore, the problem statement of the study relies on:

- Lack of study on prevalence of the disease at study area
- Lack of study on its economic loss due to the parasite and
- Lack of assessment of risk factors associated with the study parasite at study area

So that the objective of this study was:

- To determine prevalence of liver fluke or fasciolosis at study area
- To assess the economic impact due to liver condemnation resulted by the study parasite and
- To identify major risk factors.

MATERIALS AND METHODS

Description of Study Area: The study was conducted in chora wereda which is located in Oromia regional administration, Ilubabor zone at a distance of 516 km from Addis Ababa and 84 km from zonal town Mettu. The wereda has total of 783888.5 hectare of prime land and 46106.4 hectare was cultivated land. From total cultivated land 42099.33 hectare were covered by forest and 3550 hectare were grazing land. The study area has range of altitude between 1450-2500 meter above the sea level with the total human population of 115288 from which 56868 are males and 58644 females. The area receives annual average rain fall of 1500-2200 milliliter and average temperature ranges between 9-31°c. Agro ecologically the area categorized as high land 93% and low land 7% [9].

Study Design and Study Animals: For this study cross-sectional type of study design was appropriate with samples collected from cattle's slaughtered at abattoir and coprological survey also conducted on cattle slaughtered at abattoir randomly sampled.

Sample Size and Sample Size Determination: Systematic random sampling method involves selection of sampling unit at equal intervals, the first animal being selected randomly. The sampled cattle were examined for the presence of study trematodes of interest by coprology and post mortem examinations. Age, body condition score and general health condition of each sampled animals were recorded. During the study period, sampled animals were grouped in to two categories of age groups. The age grouping was based on arbitrary classification, those cattle's which have not erupted the first canine (In ruminants has commonly been accounted as fourth incisors) were classified as young while those cattle's with permanent incisor teeth were classified as adult [10, 11].

The body condition score were estimated using technique by Nicholson and Bufferworth [12] each scoring will be given number from 1(L-) to 9(F+) and grouped in to poor, medium and good.

The minimum sample size required for this particular study was determined by Thrusfield [13] with an expected prevalence of 50% and minimum of 384 sample size were needed and all the needed sample size were included.

Study Methodology

Coprological Examination: The study was conducted during routine meat inspection at kumbabe municipality abattoir. Fecal samples were collected directly from rectum of live animal or immediately after slaughter using universal screwed bottle and preserved with 10% formalin before as immediately transported to clinic laboratory. Finally all preserved fecal samples were examined by sedimentation technique for presence of fluke egg according to Urquehart *et al*. [14].

Necropsy or Post Mortem Examination: After evisceration, organs like liver and large bile duct were thoroughly and systematically examined for fasciolosis because these organs are potential predilection site for adult and young liver fluke. Simultaneously, the finding were properly recorded to correlate with coproscopic findings and information collected during ante mortem examination.

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 (SPSS).

RESULTS

From total collected samples for necropsy and coproscopy of n=384 only 56.2% (n=216) were found positive for fasciolosis at necropsy and at coproscopy prevalence of fasciolosis was estimated at about 54.4% (n=209) at the study area which is considered as remarkable.

Different species of fasciolosis were discovered and their prevalence were determined at study area as *F. hepatica* 20.6% (n=79), *F. gigantica* 13.3% (n=51) and mixed infection of 22.4% (n=86). This result indicates that *F. hepatica* was the most prevalent and mixed infection was very common and least *F. gigantica* prevalence was recorded at the study area.

Age of sampled animals in relation of infection rate was compared as prevalence of 38.8% (n=149) and 17% (n=67) were resulted for adult and young respectively with strong statistical significance (p=0.00, <0.05) which means adult cattle's are more susceptible than Young (Source: Table 3).

Body condition scores of sampled cattle's in relation of infection rate were also compared as prevalence rate of 16.9% (n=65), 34% (n=131) and 5% (n=20) were resulted for poor, medium and good body condition scores respectively with strong statistical significance (p<0.001) which means fasciolosis strongly cause body condition loss or even emaciation at chronic stage (Source: Table 4)

During the study period the effect of seasons in a relation of infection rate were also compared as prevalence rate of 40.88 (n=157) and 15.36 (n=59) were resulted respectively for wet rainy season and dry season especially in august and September prevalence of fasciolosis was significantly at the peak p-value=0.00 (Source: Tale 5).

Finally, prevalence's of necropsy and coproscopy results were compared in the following table (Table 6).

At study area all affected livers were totally condemned so that annual liver condemnation rate was assessed considering the overall prevalence of the disease versus a function of the total annual slaughter rate. Annual slaughter rate was estimated from retrospective abattoir record of the last 3 years. While retail market price of an average size liver was determined from the interviews made with local butchers in kumbabe town. Recorded data then subjected to mathematical computation using the formula set by Ogunrinade *et al*. [15]. From collected retrospective data in kumbabe municipality abattoir annually about 5600 cattle's were slaughtered.

ALC= CSR*LC*P where,

ALC= annual loss from liver condemnation

CSR= mean annual cattle slaughtered at municipal abattoir and

P= prevalence so that

ALC=5600*85 ETB*0.562= 267512 ETB/ year

Table 1: Necropsy and coprological prevalence of bovine fasciolosis at study area

No	Result or finding	Necropsy	Coprology	Total
1	Positive for fasciolosis (n)	216	209	425
	Total sample (n)	384	384	768
	Prevalence (%)	56.2	54.4	55.3

Table 2: Existence frequency of fasciola species at study area

Fasciola species	Total sample(n)	Positive(n)	Prevalence in %
F. hepatica	384	79	20.6
F. gigantica	384	51	13.3
Mixed infection	384	86	22.4
Total	384	216	56.2

Table 3: Prevalence of fasciola during necropsy in relation with age group

Age group	No of cattle examined	Prevalence in %	P- value
Adults	212	38.8	<0.001
Young	172	17	<0.001
Total	384	56.2	<0.001

Table 4: Prevalence of fasciola in relation with body condition score

Body condition score	No of cattle examined	Prevalence in %	p- value
Poor	80	16.9	<0.001
Medium	154	34	<0.001
Good	150	5	<0.001
Total	384	56.2	<0.001

Table 5: Prevalence of fasciola in relation with seasons of infection

Season	No of cattle examined	Prevalence (%)	P= value
Wet rainy season	162	40.88	<0.001
Dry season	222	15.36	<0.001
Total	384	56.2	<0.001

Table 6: Summary prevalence of fasciola between coprology and necropsy results

	Coprology		Necropsy	
Result	Positive/eggs	%	Fasciola in liver	%
Negative	175	45.57	168	43.75
Positive	209	54.42	216	56.2
Total	384	100	384	100

P- value=0.00

DISCUSSION

One of the most important factors that influence the occurrence and prevalence of fasciola in an area is availability of suitable snail habitat according to. The finding of present survey on snail habitats indicates that the presence of *lymnea* and *biomphlaria* snail species. The area was favorable for the intermediate host snail and also for the fasciola species as a result of altitude found between 1450 and 2500 meter above the sea level [17].

Result of the present study on fasciolosis (56.2% by necropsy and 54.42% coprology) was comparable with results of previous studies conducted by Zewdu [18] and Abebe [19] who reported prevalence of 57.58%, 47.45% and 32% respectively. In Ethiopia, bovine fasciolosis exists in almost all regions [20]. However, epidemiology, prevalence and species involved vary significantly with locality which is mainly due to variation in climatic and ecological conditions such as temperature, altitude, and rain fall and livestock management system. Based on [21] geographical information system which was based on moisture and thermal regimes revealed that *F. gigantic* risk could be present at elevation below 1700m.a.s.l where transmission cycle completed in single year. At extreme high (>1800 m) and low (<1200 m) elevations, pure *F. hepatica* and *F. gigantic* infections, respectively characterize the prevalence scenario. At intermediate altitude zones (1200-1800 m) mixed infection were predicted [22] also reported that in Ethiopia, *F. hepatica* and *F. gigantica* occurs in areas above 1800 m.a.s.l. and below 1200 m.a.s.l. respectively.

The result of the current study indicates that fasciolosis was an endemic condition in cattle at the study area and also indicates the existence of favorable conditions for the snails and the parasite. On the same study parasite relatively high prevalence was reported by 75.5% [23] while almost equivalent prevalence with the current study was reported (57.58%) [24]. The variation observed in these two studies could be due to the increasing climate change, the method employed for the diagnosis and the increasing trend of animal deworming by farmers.

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 [25]. 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.

There is significant difference of fasciolosis prevalence between different age groups of sampled cattle's by which adult cattle's were more susceptible than young's. This may be due to long and frequent exposure to infection and other related factors. However, another finding on fasciolosis [26] considers the disease is more apparent in young's than adults. But this finding considers more adult cattle than young's randomly because most of slaughtered cattle were adults at study abattoir.

The observed variation in the prevalence of fasciola between the months (higher in July and August, 2017) was related with the bionomic requirements for breeding of Lymnea snails and development of intra-molluscan stage of the flukes often reach optimum threshold during the wet months of the year. During dry period, breeding of the snails and development of larval fluke slow down or stop completely and snails undergo state of aestivation [27]. Moreover, the high prevalence observed during June could be associated with infection during the previous rainy season. Those infected during the major rainy season can be slaughtered after several months when their body condition gets improved.

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 AND RECOMMENDATION

The present study demonstrated that fasciola is widely distributed in Chora area with high prevalence 56.2% by necropsy and 54.42% coprology. The finding of present work is also in agreement with earlier studies strongly suggesting that priority should be given to planning and setting control program.

Based on important risk factors and epidemiological futures of fasciolosis associated with the study area the following would be recommended:

- Continuous and frequent control activity and hygienic interventions should be implemented on different water bodies and water lodged areas to make environmental condition for their breeding unfavorable.
- Strategic use of anthelminthic should be performed to reduce pasture contamination with fluke eggs. Proper year round study should be conducted so as to elaborate time of the year beneficial to apply anthelminthic.

- Further information on epidemiology of the disease, ecology and biology of intermediate host snail should be gathered to get complete information on the spatial and temporal distribution of the problem.
- Creating and further consolidation of farmers' awareness was necessary

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