Global Veterinaria 10 (5): 571-576, 2013
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2013.10.5.7375

Study on Fasciolosisof Sheep and its Intermediate Host Snail in and Around Debre–Zeit, East Shoa, Oromia Regional State, Ethiopia

Dinka Ayana and Hika Waktole

College of Veterinary Medicine and Agriculture,
Addis Ababa University P.O. Box 34, Debre Zeit, Ethiopia

Abstract: The present study investigated the prevalence of fasc iolosis, identification of *Fasciola species* and its intermediate host snailin Debre Zeit and its surrounding, East Shoa, Oromia.. Faecal samples were examined from a total of 389 sheep from November, 2010 to April, 2011. Analysis by sedimentation techniques revealed that 21(5.4%) sheep were - infected -with *Fasciola species*. A total 183 sheep were examined for liver parasites after the slaughtering process. Aprevalence rate of 35% was recorded by post mortem examination. Both species of Fasciola namely *Fasciolagigantica* (6.6%) and *Fasciolahepatica* (13.1%) were identified during this study. Mean while 28 livers (15.3%) were infected with both species. A total of 68 snails were collected and identified including-*Lymneatrancatula* (11.76%), Lymnea*natalensis* (32.35%) and the Genus Bivalvia (55.88%).

Key words: Debre Zeit · Fasciolosis · Sheep · Snail · Prevalence

INTRODUCTION

The world human population is increasing from time to time and there is a trend of increasing urbanization and elevated income that consequently leads to an increase in demand for food. Domestic ruminants constitute a major portion of Ethiopian livestock resource and are sources of proteins of animal origin [1]. Most of these animals are kept by small holder farmers and pastoralists and play major role in the economy of the country by providing meat, milk, cash, hide and draft power [2]. Despite this, livestock production has been constrained by a number of factors including nutrition, diseases, government policies and socio cultural values and attitudes. The share of parasitic diseases in this regard has been of paramount importance. Worm infestations have been found to be the single most constraint in ruminant production in the tropics. The annual loss due to endoparasitism alone in Ethiopia was estimated to be over 700 million Ethiopian birr [3].

Among the many parasite problems of domestic animals, liver fluke infection is one of the major constraints to ruminant production in Ethiopia causing considerable direct and indirect losses. Financial loss due to liver fluke infection was estimated to be 48.8 million Ethiopian birr per year of which 46.5%, 48.8% and 4.7% were due to mortality, reduced productivity (weight loss and reproductive wastage) and liver condemnation [4]. In and Debre-Zeit, there are different lakes and marshy areas which favor the perpetuation and development of snails which serve as intermediate host for the trematode parasite.

The snails of the genus lymnae are manly involved as intermediate hosts in the life cycle, *Lymnaetrancatula* (*L. trancatula)*, aquatic snail with a wide distribution throughout the world is the intermediate host four *Fasciola hepatica* (*F. hepatica*). *Lymnaenatalensis (L. natalensis)* an amphibious snail is important intermediate host for *Fasciolagigantica* (F. gigantica) in Africa [5].

Ovine fasciolosis is an economically important trematode infection of sheep caused by the liver flukes *F.hepatica* and *F.gigantica* the life cycle of which involves snail intermediate host.Fasciolosis occurs commonly as a chronic disease in ruminant and the severity sometimes depends on the nutritional status of the host [6].

Corresponding Author: Dinka Ayana, College of Veterinary Medicine and agriculture, Addis Ababa university, P.O. Box 34, Debre Zeit, Ethiopia.

Fasciolosis causes substantial economic losses which include death, loss in carcass weight, reduction in milk yield, condemnation of affected livers decline, in production and reproduction performance, predisposing animals to other disease and cost of treatment expenses [7].

Despite the significance of this parasite infection, there is no documented report on the occurrence of the parasite and its small intermediate host in and around Debre-Zeit.

Therefore, the Objectives of the Study Were:

- To determine the prevalence of liver fluke infection in and around Debre-Zeit
- Identify the species of Fasciola species circulating in the study area
- To identify the snail intermediate hosts

MATERIALS AND METHODES

Study Area: The study was conducted in and around Debre-Zeit. It is a town located at a distance of about 45km South East of Addis Ababa with an altitude of 1850 m.a.s.l. It experiences a bimodal pattern of rain fall with along rainy season from June to October and a short rainy season from March to May and has an average annual rain fall of 800 mm. The area has an average maximum and minimum temperature of 27.7°C and 12.3°C, respectively [8]. Ada'a district where Debre-zeit town is situated has a total land area of about 161,056 hectar and is divided in to three agro ecological zones namely mid land (94%), high land (3%) and low land (3%) [9].

Study Animals: Study animals comprised of 572 (389 for coprological examination and 183animals for post mortem examination).

Study Methodology: Faecal samples collected from School of veterinary medicine open air clinic were placed in petrdish and immediately submitted to the parasitology laboratory for processing and the other faecal samples were collected from field with plastic screw caped containers (The containers were air tight to avoid unnecessary easy hatching eggs in the presence of air). The samples were transported to the laboratory after keeping in the ice box with clear date of collection, species of animals, origin sex and age of the host.

Sedimentation: Procedure: Faecal samples were processed by sedimentation technique using 33% saturated zinc sulphate solution according of Soulsby, [5] and Rquhart *et al*. [10] from collected samples for each animal 3 grams of faeces were measured and put into a mortar. Then 42ml of zinc-Sulphate solution as a floating medium were added and crashed thoroughly with a pistle. The suspension then was allowed to pass through a mesh sieve into a beaker and the one left on the mesh was discarded. After gentle shaking, the suspension was poured into a conical centrifuge tube and was centrifuged at 1500 R.P.M for 3 minutes. After decanting the supernatant, the sediment was agitated till thick homogenous fluid was obtained at the bottom of the tube then the sediment sample was resuspended with a few drop of 1% methylene blue to differentiate the egg of paramphistomum. The content of the tube was mixed thoroughly with string rod of and then using a Pasteur pipette a drop of fluid was taken from the suspension and placed on a microscope slide covered with a covered slip. Then was examined under low power objective (10x-40x magnification objectives).

Adult Parasite Collection: The condemned livers, suspected gall bladders and bile duct were collected from slaughtered restaurant and submitted to laboratory being kept in ice box and observed adult trematodes were washed in 1% saline water and preserved/fixed in the 10 percent formalin.

Identification of Fasciolaspecies: Species level identification of flukes was conducted based on the size parameters and morphological features described by Soulsby [5] as follows:

The well collected and preserved adult and immature F specieswere identified under stereomicroscope. F. hepatica has leaf like shaped, broader anteriorly than posteroirly with an anterior cone shaped projection which followed by a pair of broad 'shoulders.' It is grayish-brown color, changing to grey when preserved. The ventral sucker is situated at the level of the shoulders and is about as larger as the oral. Whereas *F. gigantica* resembles *F. hepatica* itself but it is readily recognized by its longer size, being 2.5-7.5cm in length and up to 1.5cm in width. The anterior cone is smaller than that of F. hepatica, the shoulders are not as prominent and the body is more transparent.

Snail Survey: The epidemiology of fasciolosis is dependent on the ecology of the snail. Moisture is the critical factor determining the presence and extent of snail habitats which serve as transmission foci for liver flukes. Temperature is also an important factor affecting the rate of development of snails and of the stages of the parasite outside the final host. The interaction between moisture and temperature determines the survival and reproduction rate of snails and parasites [7].

In addition of Faecal and post mort samples collection, effort has been made to find out the foci of snails and also to identify the species of snails collected. The survey was carried out around Debre Zeit town at an average of 8km radius located at an altitude of 1850 m.a.s.l. Sites expected to be favorable for snail breeding have been searched. These area include low-lying swampy areas, water logged areas, drainage ditches and most vegetation and edge of lakes.

In the collection, snails visible to the naked eye and which were floating on the water surface and those on the most mud were picked-up by hand using gloove, water area which were deep and full of vegetation were searched by using palm-leaf trap and sieve made from cloth that can pass water through and which is tied to a long stick according to Yadeta [11].

At both dry and wet season of the year different snail species were collected from muddy and swampy areas, lakes of Debre-Zeit and its surroundings

Identification of Snail Species: Identification of the snail species was made by studying the morphological features of the shell based on given traits for the major snail categories according to Brown [???]. Lymneaa (Radix) natalensis measures 25*14.5mm. The spire is generally much less high than the aperture. The surface may have spiral rows of small transverse grooves, but always lacks strong spiral ridges of periostracum. Whereas (Galba)*L.truncatula* is 11*6mm (often smaller), comparatively small, with the spire about as high as the aperture and strongly convex whorls.Columela straighter and more broadly reflected than in L.natalensis and also genus bivalvia is characterized by large size (5-7 cm), hard shell and delicious in many of African country according to Emile *et al*. [12].

RESULTS

Coprological Survey: Coprological examination conducted from November, 2010 to April, 2011 indicated that from a total of 389 feacal samples examined, 21 samples were positive for Fasciola eggs (5.4%) (Table1). Adult animals were frequently affected compared to the young once since lambs (the young) usually stay around home and are less exposed to marshy areas.

As to the prevalence rates on sex basis, prevalence rates of 10 (4.7%) and 11 (6.3%) in males and females were observed respectively (Table 3). Statistical analysis of this result indicate that there is no significant variation in infection rate between the two sexes x^2=0.526, P=0.468). Nevertheless, there was significant variation in prevalence rates of fasciolosis among the origin of the animal. The highest prevalence rate was observed in Babogaya (33.3%) followed by Denkaka (27%) and Godino (20%) (Table1).

Post Mortem Examination Survey: Out of 183 liver specimens examined during study period, 64(35%) were found to be infected with *Fasciola species*. No significant difference in the prevalence of fasiolosis among origins was observed (Table 3).

Snail Survey Result: A total of 68 snails were collected and identified; *L.trancatula* accounted for 11.76% while *L. natalensis* and the genus Bivalvia accounted for 32.35% and 55.88% respectively.

Table 1: Coprological prevalence of ovine fasciolosis by origin

Origin	No. of animal examined	No. Positive (%)
Babo Gaya	6	2 (33.3)
Cheleleka	43	5 (11.6)
Dalota	11	1 (9.1)
Denbi	13	0 (0)
Denkaka	37	10 (27)
Ga.Gorba	6	0 (0)
Godino	5	1 (20)
Herna	7	0 (0)
D/Z K 01	3	0 (0)
D/Z K 02	3	0 (0)
D/Z K 04	5	0 (0)
D/Z K 07	3	0 (0)
D/Z K 08	48	0 (0)
D/Z K 12	25	0 (0)
D/Z K 13	5	0 (0)
D/Z K 14	8	0 (0)
D/Z K 15	18	2 (11.11)
Katilla	7	0 (0)
Kejima	17	0 (0)
Ketta	29	0 (0)
Sardo	9	0 (0)
Tade	4	0 (0)
Wajitu	36	0 (0)
Yerer	25	0 (0)
Migra	5	0 (0)

Total38921(5.4)

X^2=65.753, P=0.000 (Significant difference)

Table 2: Coprological prevalence of ovine fasciolosis

Category		No. of examined animal	No. Positive (%)	X^2 Value	-P-Value
Age	Adult	234	12 (5.1)	0.084	0.772
	Young	155	9 (5.8)		
	Total	389	21 (5.4)		
Sex	Female	174	11 (6.3)	0.526	0.468
	Male	215	10 (4.7)		
	Total	389	21 (5.4)		

Table 3: Post mortem examination prevalence of ovine fasciolosis based on origin

Origin	No of animals examined	No. Positive (%)
Adulala	55	16 (29.1)
Babo Gaya	4	1 (25)
Chefe	12	6 (50)
Denbi	2	1 (50)
Denkaka	13	3 (23.1)
Dire	8	5 (62.5)
Dukem	5	1 (20)
Godino	36	20 (55.6)
Mojo	17	5 (29.4)
Rob-Gebiya	17	2 (11.8)
Wedecha	8	3 (37.5)
Yerer	6	1 (16.7)
Total	183	64 (63%)

X^2=18.24; P=0.076

Table 4: Coprological prevalence of ovine fasciolosis. --

Category	No. of examined animal	Number (%)	Positive	P=Value	X^2 Value
Age	Adult	149	50 (33.6)	0.401	0.707
	Young	34	14 (41.2)		
	Total	389	64 (35)		
Sex	Female	164	60 (36.6)	0.179	0.806
	Male	19	4 (21.1)		
	Total	183	64 (35)		

DISCUSSION

The recent study was designed to determine the prevalence of ovine fasciolosis based on coprological and post-mortem examination and identifying its intermediate host snail species.

Even though Debrezeit town was surrounded with different lakes and has favorable average daily temperature (10°C-28°C) for Fasciola. 5.4% prevalence was reported by coprology. This could be due to good management practice in and around Debrezeit where owners usually take their animals to veterinary clinics for deworming.

Statistically there was no significant differences in the prevalence of fasciolosis among are group and sex both by coproplogical and post mortem examination. However significant difference (P=0.000) in the prevalence of fasciolosis was observed between the study sites with high prevalence in Babogaya (33.3%) followed by Denkaka (27%) and Godino (20%). This was found to be so because of the fact that in Babogaya (located between Babogaya Lake and Chafe marshy areas) one could observe the existence of some marshy areas, lakes and small stream which are really conducive for the development of intermediate host.

In this study out of the 64 affected livers, 15.3%, 13.1% and 6.6% were due to infection with mixed infection, *F. hepatica and F. gigantic*a respectively. This is in agreement with the work of Graber [6] who indicated *F.hepatica* to be wide spread in areas with altitude above 1800-2000 m.a.s.l. while *F.gigantica* appears to be the most common species in areas below 1200 meters, both species co-exist in areas with altitude ranging between 1200-1800 m.a.s.l.

Based on mortem examination, a total of 183 sheep were examined and 64 (35%) sheep were positive for fasciolosis). This result is higher when compared to that of Wasie [13] at Nekemte (15.97%) and (25.48%) Ashenafi [14] at HELMEX Abattoir, Debre Zeit. The present finding is lower than that by Beyazn [15] who recorded prevalence of 53.4% in Eastern Gojam.

Both species of *Lymenea* were identified in this study including *Bivalvia*, *L. natalensis (*Principal intermediate host) of *F.gigantica* was occurring second to Bivalvia, while *L. truncatula*, the major intermediate host of *F.*hepatica was found to be the least occurring, However,Yadeta[11] has reported only the presence of *L.truncatula* in and around Ambo.

CONCLUSIONS

Previously many researches/studies had been done on fasciolosis in different regions of Ethiopia. This study also witnessed that fasciolosis is one of economical important helminth infection in sheep in and around Debrezeit.

The present finding indicated that coprological examination for parasites eggs has significant limitation in detecting exactly the presence or absence of fasciolosis in animals. Even though a few sheep was positive for corpological examination, many animals were positive for fasciolosis.

Though both *F. heaptica* and *F. gigantica* were identified in the slaughtered animals, mixed infection was the dominant species involved in causing ovine fasciolosis. Its occurrence is mainly associated with the presence of ecological and bionomic factors suitable for the development of the snail intermediate host.

Control of the snail which has been the major facet of fluke control for many years, need careful ecological studies, but the tremendous reproductive potential of the snail and high cost needed for their control makes the snail control program often unsuccessful. A combination of control measures, including drainage, grazing management; fencing and molluscides have to be used to ensure a satisfactory degree of control in the long run.

Based on the above conclusion, the following recommendations are for warded:

- Coprological examination should be repeated and supported by other sensitive diagnostic methods for better results due to the intermittent expulsion of fasciola eggs and difficulty of detecting early infection.
- Education of the livestock owners and others concerned individuals in relation to epidemiology and economic significance of the parasite with appropriate husbandry system will facilitate the control measures.
- Further detailed study on the epidemiology of the disease, the biology and ecology of the snail intermediate host are useful in planning and programming control strategies.

REFERENCES

1. EASE, Ethiopia agricultural sample enumeration, 2003. Statistical report on farm management practice, livestock and farm implement part II, results at the country level, Addis Ababa, Ethiopia, pp: 219-235.
2. Kasahun, A. and H.G. etaneh, 1986. The production characteristics of sheep and goats in Ethiopia: a review, reassert officer, Institute of agricultural research, animal production and nutrition team, Ministry of Agriculture, Addis Ababa, Ethiopia.
3. Mulugeta, H.S., T. Getachew, M. Tafesse, W.M. Getachew, G. Kinfe and Y. Teshome, 1989. Paper presented at the third livestock improvement conference held in Addis Ababa Ethiopia.
4. Ngategize, P.K., B. Tekelye and T. Getachew, 1993. Trop Anim. Hlth. Prod, 23: 155-167.
5. Soulsby, J.L., 1982. Helminthes, Arthopods and protozoa of domesticated animals 7th ed. Bailler Tindal, London, pp: 44-50.
6. Graber, M. and P. Daynes, 1971. Molluscs: human and animal vectors of trematodes in Ethiopia. Review animal Breeding and veterinary medicine of the Tropical Countries, 27: 307-322.
7. Takele, A., 1995. Bovine fasciolosis prevalence and economic impact at Mekelemuscicipaabttor/Tigray region) DVM Thesis, FVM, AAU, Debrezeit, Ethiopia.
8. Central, Agricultural census commission (CACC), 2003. Ethiopian central agricultural sample enumeration, 2001/2002, Statistical report on live stock and farm implements Addis Ababa, Ethiopia.
9. ADAO, 2010. Ada'a district Agricultural office.
10. Urquhart, G.M., J. Armour, J.L. Duncann and A.M. Dunn, 0000. Jennings, 2nd ed. Black well Science Ltd., London, pp: 102-103.
11. Yadeta, B., 1994. Epidemiology of Bovine ovine fasciolsosis A preliminary survey in Nekemte and its surrounding areas, DVM, thesis, AAU, FVM, Debre Zeit, Ethiopia.

12. Emile, A. Malek, Thomas and C. Cheng, 1975. Medical and economic malacology.
13. Wassie, M., 1995. Prevalence of Bovine and ovine fasciolsosis A preliminary survey in Nekemte and its surrounding areas, DVM, thesis, AAU, FVM, Debre Zeit, Ethiopia.
14. Ashenafi, T., 2010. Prevalence of *Stilesia* hepatica, Fasc iola and Cysticercustenuicolis in liver of sheep and goats slaughtered at HELMEX abattoir, DVM Thesis, AAU, FVM, Debrezeit, Ethiopia.
15. Beyazn, C., 1995. Preliminary study on epidemiology of bovine fasciolosis eastern Gojam regions, DVM Thesis. FVM, AAU, Ethiopia.