European Journal of Biological Sciences 9 (2): 67-71, 2017
ISSN 2079-2085

DOI: 10.5829/idosi.ejbs.2017.67.71

Concurrent Infection of *Fasciola*, *paramphistomum* and *Schistosoma* in Cattle Coprological and Abattoir Survey in Hawassa Municipality Abattoir South Ethiopia

[1]Negash Desta and [2]Shiret Belete

[1]Jimma University College of Agriculture and Veterinary Medicine, Jimma, Ethiopia
[2]Faculty of Veterinary Medicine, University of Gondar, P.O. Box 196, Gondar

Abstract: This study was conducted in Hawassa municipal abattoir to investigate the concurrent infection of *Fasciola*, *Paramphistomum* and *Schistosoma* in cattle and to compare diagnostic efficiency of coprological examination and postmortem examination. Coprological examination is performed by using sedimentation technique and postmortem examination screened by worms of *Fasciola* in the liver and *Paramphistomum* in the rumen. 3.3% from the total positive animals , 10.4% had *Fasciol*a and *Paramphistomum* infections, 10.9% had *Schistosoma* and *Paramphistomum* infections while 5.73% had *Fasciola* and *Schistosoma* infections. In the case of postmortem examination of the two parasites which is 30.4% concurrently had *Fasciola* and *Paramphistomum* infections *Schistosoma* is left out because of difficulty of predilection site. This gap between coprological and postmortem examination result may be due to need of longer period after infection for the appearance of eggs in the feaces, further the detection of eggs and the appearance of the disease in some areas were difficult during the prepatent period because eggs are expelled intermittently depending on the evacuation of gall bladder and life cycle. There is significant relation between coprological and postmortem examination $P<0.05$ for these probable reason may be due to need of longer period after infection for the appearance of eggs in the feaces and further the detection of eggs and the appearance of the disease in some areas were difficult during the prepatent period.

Key word: Coprological · *Fasciola* · *Paramphistomum* · *Schistosoma*

INTRODUCTION

Ethiopia has the largest livestock population in Africa. An estimate indicates that the country is a home for about 57.83 million cattle, 28.04 million sheep and 28.61 million goats [1]. However, many factors affect the maximum benefit to be obtained from livestock production and parasitic diseases are the major factors [2].

These farm animals are the major backbone of agricultural sector's income for Ethiopia and its livestock owners. Parasitism is one of the major bottle necks to livestock development in the tropics including Ethiopia. Parasitic diseases are a global problem and considered as a copacetic obstacle in the health and products performance of animals [3].

The class trematode fall in two main subclasses, the Monogenia, which have direct life cycle and the Digenia, which require an intermediate host. The adult digenetic trematodes commonly called 'flukes' occur primarily in the bile ducts, alimentary tract and vesicular system [4]. The bodies of trematodes or flukes are dorsoventrally flattened and are unsegimanted and leaf like. There are many families in the class Trematoda and those which include parasites of major veterinary importance are the Fasciolidae, Dicrocoeldae, Paramphistomatidae and Schistosomatidae. Of lesser importance are the Troglotrematidae and Opisthorchiidae [4].

In general the digenetic trematodes are dorsoventrally flattened, some being long and narrow, some leaf shaped while few, the *Amphistosomes*, have thick fleshy bodies. The *Schistosomes* are long and worm like [5].

The cuticle, or more correctly the tegument, may be smooth or spiny but as well as an outer covering. The digestive system opens at the mouth which is surrounded by the anterior sucker. The organs of attachment consists of an anterior sucker (Oral sucker) placed at the anterior end of the body and ventral sucker or acetabullum usually in the anterior third of the ventral surface [5].

Corresponding Author: Shiret Belete, Faculty of Veterinary Medicine, University of Gondar, P.O. Box 196, Gondar, Ethiopia.

The nervous system is simple, consisting of a pair of longitudinal trunks connecting anteriorly with two ganglia. The trematodes are usually hermaphrodite and both cross- and self-fertilization may occur except *Schisitomatidae* and *Diamozoidae* [4, 5]. The male consists of a pair of testes each leading in to vas deference: these join to enter the cirrus sac containing a seminal vesicle and the cirrus, a primitive penis which terminates at the common genital opening. The female has a single ovary leading in to oviduct which is expanded distally to form the ootype. The mature egg is usually yellow because of the tanned protein shell and most species have an operculum [4].

The essential point of the life cycle is that where as one nematode egg can develop in to only one adult, one trematode egg may eventually develop in to hundreds of adults. This is due to the phenomenon of paedogenesis in the molluscan intermediate host [4].

The study was undertaken with the following objectives:

- To determine the concurrent infection of *Fasciola, Paramphistomum* and *Schistosoma.*
- To compare diagnostic efficiency of coprological examination and postmortem examination.

MATERIALS AND METHODS

Study Area: The study was conducted in Hawassa town municipal abattoir. Hawassa is the capital city of southern nation nationalities and peoples regional state (SNNPR). It is located at 275 km distance south of Addis Ababa, and found in an altitude of 1500-2000 meters above sea level between 4°27' and 8° 30'N latitude, 34°21' and 39° 1'E. The total population of Hawassa is estimated to be 150,000 km^2. The average annual rainfall is 800-1000 mm while the average daily temperature is 20.1°C-25°C respectively [1].

Study Animals: The study animals are comprised of local breeds of male cattle, which are slaughtered at Hawassa municipal abattoir. Most of the slaughter animals were originated from the Sidama zone (Tula and Wonago) while some of the animals originate from ArsiNegele, Adama, Borena, TikureWuha and Harar areas.

Study Population: The study population includes local breeds of male cattle and 384 animals were randomly selected to determine the infection of bovine *Fasciola, Paramphistomum*and *Schistosoma*. All these animals were privately owned by smallholder farmers and were managed under traditional extensive system and depended mainly on grazing with a minimum or no supplementary feed and health care were provided.

Sample Size and Sampling Method: The required sample size of the study animals was determined using the formula simple random sampling given in Thrushfield [6].

$$n = \frac{1.962(Pexp(1-Pexp))}{d^2}$$

wheren is the required sample size, Pexp is the expected prevalence and d is the desired absolute precision.

A 50% expected prevalence with 95% confidence interval and 5% desired absolute precision was used to determine the sample size required for the study. Hence, substituting these values the required sample size was determined to be 384 cattle.

Coprological Examination: Prior to sampling; each animal presented to the abattoir for routine meat inspection was given an identification number. Feacal samples were collected from the animals and the samples were taken to the laboratory in tightly closed universal bottles and examined for eggs by using the techniques of sedimentation [5].

Postmortem Examination: During meat inspection, the previously identified animals were examined. Examination of the livers for *Fasciola*, their rumen for *Paramphistomum* and Inspection of the mesenteric vein for *Schistosoma* of small intestine was carried out.

Data Analysis: The collected data were entered in to Microsoft excel SPSS version 22.0.0 for analysis. Data were described by using descriptive statistic. In the mean time, chi-square was used for the association of Coprological and Post mortem examination of the aforementioned parasites. 95 % confidence interval with a 5 % marginal error was assumed during the course of the analysis.

RESULTS

A total of 384 adult indigenous cattle, delivered to Hawassa municipal abattoir, were investigated for the occurrence concurrent infections of *Fasciola, Paramphistomum* and *Schistosoma.* Among the total feacal samples examined, 24.0% for *Fasciola*, 37.0% for *Paramphistomum*and 17.2% for *Schistosoma* were found

Table 1: Concurrent infections of bovine *Fasciola*, *Paramphistomum* and *Schistosoma* in Hawassa municipal abattoir by coprological examination and postmortem examination

	Coprological Examination		Post Mortem Examination	
Fasciola + *Paramphistomum*	40	10.4 %	117	30.4 %
Paramphistomum + *Schistosoma*	42	10.9	27	12.6%
Fasciola + *Paramphistomum* + *Schistosoma* +	13	3.3%	21	9.6%

Table 2: Infections of bovine *Fasciola*, *Paramphistomum* and *Schistosoma* in Hawassa municipal abattoir by coprological examination and postmortem examination

	Coprological examination		Postmortem examination			
Parasite examined	% positive	% negative	% positive	% negative	x^2	P value
Bovine *Fasciola*	24.0	76.0	30.2	69.8	1.325	<0.001
Bovine *Paramphistomum*	37.0	63.0	57.0	43.0	1.14	<0.001
Bovine *Schistosoma*	17.2	82.8	21.2	50.02	0.6	<0.001

to be positive. From a total, 3.3% were positive for all the three parasites, 10.4% were for *Fasciola* and *Paramphistomum*, 10.9% were infected with *Paramphistomum* and *Schistosoma* and 5.73% were infected with *Fasciola* and *Paramphistomum*.

Postmortem examination was also carried out on the same animals for *Fasciola, Paramphistomum* and *Schistosoma.* Out of the 384 cattle, 116 cattle were positive for *Fasciolosis* giving a mean infection rate of 30.2% and 218 were infected for *Paramphistomum* giving the infection rate of 56.8%. Among these animals, 30.4% were infected with both *Fasciola* and *Paramphistomum* and *Schistosoma* infected animals are 12%.

DISCUSSION

Out of 384 feacal samples examined 24.0% were found to be positive for *Fasciola,* 37.0% were found to be positive for *Paramphistomum* and 17.2% were found to be positive for *Schistosoma* of bovine parasites using sedimentation technique as diagnostic method. With postmortem examination, the same animals were examined for *Fasciola* in the liver 30.2%, in the rumen for *Paramphistomum* the infection rate was 56.8% and *Schistosoma* 21.2%.

The present study revealed the overall prevalence of *fasciolosis* to be 30.2% recorded which is lower when compared with previous reports in Wolliso 46.58% at Jimma abattoir [7]. From African countries, prevalence of 53.9% was reported from Zambian abattoirs [9]. This might be due to the difference in agroecological differences of the areas coupled with the presence or optimal base temperature necessary for snail vectors [4].

Both species co-exist in Ethiopia in areas with an altitude range of 1455-1700 m.a.s.l. Mixed infection may occur in the liver of the same animal so long as ecological conditions conducive for replication of both snail species exist and intermingling of cattle from various grazing areas occur [7]. However, the prevalence rate, epidemiology and the species involved vary with locality. One of the most important factors that influence the occurrence of *fasciolosis* in an area is availability of suitable snail habitat [5].

In the present study the occurrence of *Paramphistomum* was 56.8% which is lower than Solomon and Abebe [9] in Fogerawored (76.0%). In the study, the occurrence of *Schistosoma* by Coprological examination was 17.2% and higher when compared with previous reports by similar diagnosing method in different parts of the country Mersha [9] (3.1%); Zelalem [10], 12.5%, Mengistu *et al.* [11] 13.70%, prevalence in Fogeraworeda and Yalelet [12] 17% and Almaz and Solomon [13] 10.93% in Bahir Dar. This is may be due to difference in ecology.

Paramphistomum distribution is worldwide. They are of little veterinary importance in Europe and America, but are occasionally the cause of disease in the tropics and subtropics [4]. *Paramphistomiasis* has been a neglected trematode infectious disease in ruminants, but has recently emerged as an important cause of productivity loss [1].

The concurrent infection of the cattle by the three trematodes in the study revealed 3.3% harbored all the trematodes, 10.4 harbored *Fasciola* species and *Paramphistomum* species infection, 10.9% had *Paramphistomum* species and *Schistosoma* species infections and 5.7% had *Fasciola*and *Schistosoma* species infection recorded which is lower when compared with previous reports of concurrent natural infections of trematodes in Zambia [14] where a total of 32% harbored all the three trematodes, 66% had *Fasciola* species and *Paramphistomum* species infection, 52% harbored *Schistosoma* species and *Paramphistomum* species infection.

The prevalence of both *fasciolosis* and *paramphistomosis* is higher in postmortem findings than coprological one. The difference is statistically significant ($P<0.05$) this may be attributed to the need of longer period after infection for the appearance of eggs in the feaces [5]. Further the detection of eggs and the appearance of the disease in some areas were difficult during the prepatent period because eggs are expelled intermittently depending on the evacuation of gall bladder and life cycle [4].

This study was conducted in a period known to be dry in Ethiopia; however, the prevalence observed was considerable and reflects the existence of suitable ecological conditions in the area of the origin of the study animals for snail breeding and development of larval stages within the snail intermediate host throughout the year regardless of the season. This finding is consistent with a dry season observation of Jobre and Ali [15].

CONCLUSION

The current study with abattoir survey and coprological examination has documented high infection rate of bovine trematodes in and around Hawassa area. This was more substantiated with the presence of ecological factors suitable for both the parasite and the intermediate host snails. Generally from various points of view, considering the infections of trematodes one can strongly conclude that trematode is one of the most important livestock parasitic diseases which impose huge impact to the nation's economy. Hence due emphasis should be given to the control program of the disease. Occurrence of such a high rate of infection of *Fasciola*, *Paramphistomum* and *Schistosoma*is are clear indicated.

Therefore, attention should be paid to the following actions:

- Restriction of animal's movement in to the snail habitat with introduction of the practice of growing forage plants and fencing and draining swampy areas.
- Awareness should be created among the community about how to control these parasites and economic significance of the diseases and to be ready to take measures.
- The farmers of the area should be well oriented about the hazards of the disease to their livestock so that they can actively participate in the control program.
- Avoidance of swimming in snail infected water because of the *schistosma* infection in humans occurred by swimming cercariae.
- Finally the farmers should be well informed about the impact of the disease control programs and good livestock management system.

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