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Study on Prevalence of Ovine Fasciolosis in and Around Debre Berhan Sheep Breeding and Forage Multiplication Center

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Research Article

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Abstract

A study was conducted to determine the prevalence of ovine fasciolosis in Debre Berhan region based on clinical, abattoir and field survey from November 2007 to March 2008. Of total 475 ovine faucal samples examined 229 (48.21%) positive for fasciolosis. Sex wise Prevalence off sciolosis 73.05% in male and 26.95% in female animals. Statistical analysis of prevalence rate on sex basis showed no significant difference (P>0.05) infection rate between the two sexes. Age wise prevalence recorded was 67.79% in adult and 32.21% in young. Analysis of infection rates on age basis had no significant differences (P>0.05). Asite wise of fasciolosis were 28%, 13.68%, 19.37%, 32.63%, and 6.32% in Atekelt, Delacha, Genet, Kerafino and Seladigay respectively. Statistical analysis of prevalence rate on site basis showed significant difference (P<0.05) in infection rate between sites. Breed wise of fasciolosis was 75.53% local, 18.11% cross and 6.53% exotic breed is recorded. Statistical prevalence rate on breed basis showed significant difference (P<0.05). The monthly prevalence of fasciolosis recorded was, 12.42%, 39.16%, 37.05, 5.05 & 6.32% in November, December, January, February and March respectively. The difference in monthly prevalence was significant (P<0.05). The result of the study has been discussed in detail in comparison with the finding of other workers and in relation to site and ecological condition of the area that affects the prevalence rate of fasciolosis. Finally, appropriate control strategies implemented in the study area is recommended to reduce the impact of fasciolosis on livestock production in the area.

Keywords: DebreBerhan; Fasciolosis; Ovine; Prevalence

Introduction

In Ethiopia, agriculture is the dominant sector of the economy and accounts for over 50% of the GDP, 30% of the export revenue, and provides livelihood for over 80% of its inhabitants .At present four-fifths of the Ethiopia population is engaged in agriculture as small holder farmers who are responsible for 95% of the total agricultural output. Livestock provides about 35%of agricultural products [1]. In Ethiopia, in particular, the livestock sub sector shares about 65% of the potential agricultural land but contributes only 10%to the GDP [2].

The animal species important today for food and agriculture production are consequence of processes of domestication that have been continuing for almost 1200 years. These resulted in development of genetically distinct breeds through the combined response of selection pressures by human communities in identifying and making greater use of preferred genotypes amongst the available animals overtime and the selection pressures imposed by the environmental stress factors which operate through differential reproduction and survival of parent animals and their offspring to realize high adaptive fitness of the breed in the environment. This diversity is largely due to Ethiopia's geographical location near to the historical entry point of many livestock population, the size and diversity of agro-ecological zones, cultural condition, the huge population size and wide range of production systems [3].

Livestock plays a vital role in farming systems of Ethiopia. In mixed crop-livestock systems of the highlands, livestock is mainly used for traction to under taken cultivation, threshing, transport and trembling as a final seedbed preparation. Meat and milk are used for home consumption a well as sold on the market to get cash. The sale of livestock and livestock products serve as a source of cash in come to buy household needs and agricultural inputs. Manure and urine are used to fertilize annual and permanent cropped land [4].

Animal diseases are an everyday occurrence to all of these people, as animals of resource poor are particularly vulnerable to disease (due to many reasons including the presence of a wide range of disease causing organisms, lack of access to and resources for, animal health and production inputs and services), and the resource-poor often handle and consumer products that do not pass though normal inspection and quality assurance processes. Furthermore, resource-poor farmers usually have few animals, so the loss of individual animals has proportionally greater significance [5].

Animal production is an important part of the agricultural sector of the Ethiopian economy. The live-stock population of the country is the largest in Africa. However, production is well below potential due among other reason, to the poor health status of the national herd [6]. On the other hand a reliable water supply suitable for irrigation, coupled with the necessary input, can boost agricultural production and ensure self sufficiency. Globally, many countries are dependent on irrigated agriculture to produce food for consumption and cash crops to enhance the food security of their people and to generate income. Also, irrigation is the most common means of ensuring sustainable agricultural and cropping with periods of inadequate a in fall and drought [7].

Helminthiasis is considered as one of the major constraints in live stock improvement programmer in Ethiopian. One of the helminthiasis that causes immense direct and indirect losses especially in domestics ruminants is fasciolosis. It is serious hazard to efficient production of cattle and sheep, particularly in its sub clinical forms where it has been shown to reduce growth rates, feed conservation, fertility and milk yield [6]. In the high lands of Ethiopia agriculture is the pillar of economy and is basically a subsistence crop livestock mixed farming system with considerable dependence on natural rain. The current trend towards food self-sufficient is through the use of irrigation as a means of increase food production to cope with the rapidly increasing population of the country. Thus, implementation of irrigation projects will be expected to bring about changes in land use patterns and intensification of labor [7]. The increasing number of dams and irrigation canals built to boost energy and food production will also increases the number of potential snail habitats and with them the risk and incidence of fasiolosis [8].

Fasiolosis, caused by *F. hepatica* and *F. gigantica* is one of the most prevalent helminthes infection of ruminants in different parts of the world. It causes significant morbidity and mortality. Both the highland (*Fasciola hepatica*) and the low land (*F. gigantica)* types of liver 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 (sites) with seasonally flooded postures, grazing is as of lakeshore, slowly flowing waterways, and banks of rivers

are among the conductive environment for breeding of snails' vectors of fasciolosis. This snail born trematode infection is one of the major diseases contributing to loss in productivity of livestock industry in Ethiopia [9,10].

The disease and suitable snail habitats exist in different areas of the country .The spreading of hepatic fasciolosis to new areas depends upon the spread of host snails and infected animals. The snails themselves can be infected and can spread the disease without the movement of the host. Therefore, location of the snail habitats is an important factor in the control program. It is also important to note outbreak of fasciolosis does not occur in the absence of the intermediate host. Among the major livestock parasitic diseases responsible for high prevalence rate and significant economic losses on livestock production particularly in sheep and cattle fasciolosis [11]. Fasiolosis is known by different local names in various parts of Ethiopia that vary according to the region and language. In Amharic it is called "Kulkult", "Wadomma", "and yegubet tile". In Oromo area it is known as "Dadao", "Losha", and "RammoTiruu". In Tigray language it is termed "Ifil" [6]. The incidence of fasciolosis is dependent on prevailing weather condition which effects the life cycle of the parasite, the propagation of its intermediate host snails, and survival of metacercariae on the pasture. The rainfall is however much more variable with belong average rainfall experienced in January, February, June and July. These probably represented infection acquired following the winter infection of snails. Also the incidence of fasciolosis in Ethiopia domestic livestock is known to be relatively high. Generally speaking, however few attempts have been made to study the incidence of this parasitic problem in various sections of the parasite burden, especially in relation to months of a year, rainfall and temperature, altitude and other relevant factors.

Fasciolosis occurs commonly as a chronic disease in cattle and severity sometimes depends on the nutritional status of the host. It causes a substantial economic loss which include death, loss in carcass weight, reduction in milk yield, condemnation of affected livers, decline in production and reproductive performances ,predispose animals to other diseases and cost of treatment expenses [12]. Fasciolosis in ruminants ranges in severity from a devastating highly fatal disease in sheep to asymptomatic infections in cattle .The severity of pathological manifestations usually depends on the number of metacercariae ingested over a period of time and the relative susceptibility of the animal [13].

In sheep fasciolosis may be acute, sub acute or chronic .Acute disease occurs 2-6 weeks after the ingestion of large number of metacercariae and is due to severe hemorrhage which results when the young flukes migrating in the liver parenchyma is also severe .In sub acute disease metacercariae are ingested over a longer period and while some have reached to bile duct, where cause cholangitis, others are still migrating causing lesions less severe. The chronic disease is occurs 4-5months after the ingestion of moderate numbers, 200-500, of metacercariae. Clinically, it is characterized by a progressive loss of condition and the development of anemia and hypoalbuminaemia which can result in emaciation, pallor mucous membranes, sub mandibular Oedema and ascites [14].

The economic significant of fasciolosis in the highlands of Ethiopia has been reported by several workers [15-17]. Although, the lowland areas of the country have been known to use some irrigation, information on the impact of fasciolosis in such environments lacking. An estimate of the economic loss due to ovine fasciolosis in the Ethiopian high lands was made based on available data on mortality weight loss, reduced reproductive efficiency and liver condemnation at slaughter. The economic effects of fasciolosis were identified and models for estimating the financial loss presented. Ovine fasciolosis losses were estimated at 48.8million Ethiopian Birr per year of which 46.5%, 48.8% and 4.7% were due to mortality, productivity (weight loss and reproductive wastage) and liver condemnation, respectively.

The smallholder farmers may not easily detect the effect of internal parasites on performance of their animals because of the generally sub clinical or chronic nature of the helminhosis. Control of gastro intestinal nematode infections of livestock species in the smallholder farmers and pastoralist communities is usually made with some anthelmitic drugs [18].

Diagnosis is based primarily on clinical sign, seasonal occurrence, and privies history of fasciolosis on the farm or the identification of snail habitats, postmortem examination, hematological tests and examination of faeces for fluke eggs. Even though, it is difficult to detect fasciola in live animals, liver condemnation at slaughter or necropsy was found to be the most direct, reliable, and cost efficient technique for the diagnosis of fasciolosis [14].

The control of fasciola in sheep and cattle is achieved through a combination of the snail and the treatment of infected cattle [19]. However, because of the extreme efficiency of this parasite and the way in which it takes advantage of environmental conditions to multiply enormous careful study of its ecology is necessary to predict periods of danger and initiate strategic attacks on both snail and flukes [20].

The objective of this study is to:

- Study the prevalence of ovine fasciolosis in and around DebreBerhan through coprological and Abattoir survey and assessment of economic loss due to ovine fasciolosis.

Material and Method

Study Area

Debra Berhan is city and woreda in central Ethiopia located in north shewa zone of the Amhara region, which lies at latitude 9º31N and longitude 39º28 E with an altitude of 2,780 meters above sea level. This is a mountainous area dissected by rivers and streams. The area receivers' appreciable high rain falls. The grazing lands found around DebreBirhan are drained by these streams and pocketed by water logged (marshy) areas. The climatic of the region is mainly season kiremet (July-September) a short rain season Belg in February Analysis of compiled data from 1973-1993 revealed that the average annual rain fall in the reign is 920mm,whil the average monthly minimum and maximum ranges of air temperature vary between from 2.4°C to 8.5°C and 18°C to 23.3°C , respectively. Soil temperature ranges 11.7°C in September and October to 14.9°C in March and May (average 13.6°C) at 5cm depth. DebreBerhan has an estimated total population of 67,243 of whom 34,055 were males and 33,185 were females. The woreda has an estimated area of 14.71 square kilometer. According to the 1994 national census, this town has a population of 38,717 people. The town of DebreBirhan is renowned for its rug making and production of Araki- a very potent distilled alcoholic spirit. The local economy is predominantly agriculture [21].

Study Animals and Sample Size

A total of 475 sheep (154 from kerafino, 133 from Atekelt, 87 from Genet, 71 from Delacha and 30 from Seladingay) were randomly collected and examined by following coprological examination procedure. The study was conducted in sheep at the field areas from farmers which bring in DebreBerhan Veterinary clinic and from farm in DebreBerhan sheep breeding and forage multiplication center in the study areas. Since there is no pervious information on the level of prevalence of ovine fasciolosis was estimated 50%of expected prevalence and the sample size was determined using the formula [22].

$$N = \frac{1.96^2 \times P_{exp} \times (1-P_{exp})}{d^2} = 384$$

N=number of study population
P_{exp}=expected prevalence
D=desired precision

The total number of population proposed was 384. But the total number of animal examined was 475. In the abattoir survey the sample examined was 120 because the number of animal slaughtered is very small and the abattoir is closed during fasting totally. And also the number of animal examined in clinic was 154. Most of the sheep slaughtered at DebreBerhan municipal abattoir were brought from local market in the town which has the main Menz, Yifat and Ankober almost all the places have characteristic high land climate as of DebreBerhan.

Study design

Cross sectional study will be conducted to determine the prevalence of fasciolosis in selected study area.

Prevalence study

The survey was made on sheep around the study area. Regular visits were made to the clinic, abattoir and field area including DebreBerhan sheep breeding and forage multiplication center and research center farm for sample collection. The fecal sample was collected with sterile material and transported to the laboratory and then examined.

Fecal smear (for identification of egg and larvae) and segmentation techniques (for detecting trematode in the feaces) were applied. Then after McMaster fluke egg-counting technique was applied to know eggs in gram of faeces (EPG). Finally the data obtained was entered in to Microsoft excel and subjected for statistical analysis.

Abattoir study

Postmortem examination was conducted in DebreBerhan municipal abattoir. At postmortem the livers of the animals were incised and examined for the

presence of fluke. An estimation of economic loss due to liver condemnation was done.

Coprological Examination

Feacal samples was collected from sheep and transported to laboratory for farther examination & identification of parasites (Annex 1).

Sedimentation Techniques

The majority of trematode eggs are too large and heavy to float reliable in the flotation fluids normally used for nematode eggs. They do however sink rapidly to the bottom of a faecal or water suspension (Annex 1).

Data analysis

The field, abattoir and clinical investigation for prevalence were analyzed using statistical package for STATA 7.1. Variation of the prevalence between different groups was analyzed by using chi square (X^2) test. The associations of fasciola infection rates on the basis of sex, age, breed; site and EPG were compared using chi-test or t-test.

Results

Prevalence Study

From a total of 475 faecal samples examined from sheep (local, cross and exotic) breeds for ovine fasciolosis during the study periods, 229 samples were positive for liver fluke infections with an overall prevalence rates of 48.21% (Table 1). Variation in prevalence rate was observed among the five study sites from which the samples were collected. Accordingly, the prevalence rates recorded were 32.63% in Kerafino, 28%in Atekelt, 19.37% in Genet, 13.68% in Delacha and 6.28% in Seladingay (Table 2).

Infection rates on age basis were also compared and as a result, no significant difference in prevalence was observed between the two age groups (Table 3). The calculation of prevalence rates on breed basis showed the prevalence of 75.37%, 18.11% and 6.53% in local , cross & exotic respectively (Table 4).

Result	No. of Animal Examined	Prevalence (%)
Negative	246	51.79
Positive	229	48.21
Total	475	100

Table 1: The overall prevalence of ovine fasciolosis in the sampled animals.

Site	No. of Animal Examined	No. of positive Sample	Prevalence (%)
Atekelt	133	14	28
Delacha	65	53	13.68
Genet	92	54	19.37
Kerafino	155	98	32.63
Seladingay	30	10	6.32
Total	475	229	100

X^2=125.2694 P=0.000

Table 2: Prevalence of ovine fasciolosis on site basis.

Age	No. of animal examined	No. of positive sample	No. of Negative Sample	Prevalence (%)
Adult	322	156	166	67.79
Young	153	73	80	32.21
Total	475	229	246	100

X^2=0.0224 P=0.881

Table 3: Prevalence of ovine fasciolosis on age basis.

Breed	No. of Animal Examined	No. of positive sample	No. of Negative Sample	Prevalence (%)
Cross	36	69	17	18.11
Exotic	31	12	19	6.53
Local	358	148	210	75.37
Total	475	229	246	100

X^2=43.2069 P=0.000

Table 4: Prevalence of ovine fasciolosis on breed basis.

Clinical Survey

From the total of 154 faecal sample examined during clinical observation of sheep 104 were positive while 54 were negative, with prevalence rate of 67.53% and 32.47% respectively. The statistical analysis was performed on the site basis i.e57.79% in Genet and 42.21% in Kerafino (Table 5).

The prevalence rate on the basis of sex also analyzed and the statistical analysis 76.68%in female and25.325 in male showed no significant difference(X^2=0.8558, df=1, P>0.05) (Table6). In addition there was significant differences(X^2=8.9562, df=1, P<0.05) between breeds (local and cross) which had prevalence rate of 61.04% and 38.96% (Table 7).

Site	No. of Animal Examined	No. of positive sample	No. of Negative Sample	Prevalence (%)
Genet	89	51	38	57.79
Kerafino	65	53	12	42.21
Total	154	104	50	100

X^2=10.0626 p=0.002

Table 5: Prevalence of ovine fasciolosis on basis of site in clinical survey.

Sex	No. of animal examined	No. of positive sample	No. of Negative Sample	Prevalence (%)
Female	115	80	35	76.68
Male	39	24	15	25.32
Total	154	104	50	100

X^2=0.8558 p=0.355

Table 6: Prevalence of ovine fasciolosis on basis of sex in clinical survey.

Breed	No. of animal examined	No. of positive sample	No. of Negative Sample	Prevalence (%)
Local	94	55	39	61.04
Cross	60	49	11	38.96
Total	154	104	50	100

X^2=8.9562 p=0.003

Table 7: Prevalence of ovine fasciolosis on basis of breed in clinical survey.

Abattoir survey

Of the total 120 liver observed in D/Berhan municipal abattoir 116(96.67%) were totally condemned while the remaining 4(3.33%) were free from infection. The prevalence rates between male and female animals were compared, but there was no statistically significant difference (X^2=1.0507, df=1, P>0.05) (Table 8).

Sex	No. of Animal Examined	No. of Positive Sample	No. of Negative Sample	Prevalence (%)
Female	87	85	2	72.5
Male	33	31	2	27.5
Total	120	116	4	100

X^2=8.9562 P=0.003

Table 8: Prevalence of ovine fasciolosis on sex basis in abattoir survey.

Discussion

Bergeon P [23] found that the infection rate of 90% in Shoa and Gojjam, while Bahru G & Ephraim M [24] reported an infection rate of 63%. In the present study, the prevalence rate obtained in sampled ovine was 48.21%. Compared to the previous studies this prevalence rate was lower. Previous study carried out in DebreBerhan detected the highest infection rate at November [25]. In the present study the higher prevalence rate recorded was because of the increasing awareness of the people in the study area about the need of using anthelmintics to treat fasciolosis. However; the drug usage is not strategic it is only applied in clinically sick animals.

Prevalence rate of 73.05 % and 26.95% was recorded in female and male animals respectively. While infection rates of 67.79% and 32.21% were found in adult and young animals respectively. The statistical analysis of infection rates on the basis of age and sex indicated that there was no significant differences (P>0.05). This signifies that both sex and age seems have no impact on the infection rate i.e. both sex & age groups are equally susceptible to fasciolosis. Similar results that support the present finding were reported by Mulualem E [12] and Wessie M [7].

According to statistical analysis of infection rates on the basis of site (sampling areas), the lowest prevalence rate (6.32%) was recorded at Seladingay, while the highest rate (32.63%) was observed at Kerafino. These differences in prevalence among the five selected study sites were statistically significant (P<0.05) (table 2). Similar result that support the present finding was reported by Michael A et al. [26].This was because the selected five sites, Seladingay, at which the lowest prevalence rate recorded is not an ideal habitat for the intermediate host snails.

The prevalence rates on the basis of breeds were 75.37%, 18.11% and 6.53% in local, cross & exotic breeds respectively. The differences in prevalence among the three breeds were statistically significant (P<0.05). These differences may be due to differences in management practices among the three breeds. The infection rate recorded in exotic breed was not high as in the other breeds because they kept in the house.

The prevalence rates of 62.87% and 10.53% were found in extensive and intensive farming systems

respectively. The difference observed was a statistically significant (P<0.05). Although, the farming system is intensive one, but there was no strategic pastureland management. For instance they use strategic dewarming with anthelmintics in the interval of three months.

The monthly prevalence of fasciolosis recorded was, 12.42%, 39.16%, 37.05, 5.05 & 6.32% in November, December, January, February & March respectively. The difference in monthly prevalence was significant (P<0.05). This difference may be due to bionomic factors such as monthly total rainfall, average humidity and temperature. Similar work was done by Mulualem E [12] (Table 9). High prevalence rate were recorded in December and January during the study period. Previous studies carried out in DebreBerhan have indicated October/ November as period of maximum infection of sheep with liver flukes [25].

Season	No. of Animal Examined	No. of Positive Sample	No. of Negative Sample	Prevalence (%)
Nov	59	11	48	12.42
Dec	186	67	119	39.16
Jan	176	125	51	37.05
Feb	24	16	8	5.05
March	30	10	20	6.32
Total	475	229	246	100

X^2=74.3415 P=0.000

Table 9: Prevalence of ovine fasciolosis on month basis in abattoir survey.

An attempt has been made to see whether there is difference in the mean EPG between the two sexes. T- test Analysis of the result showed Although, the mean EPG value for female was greater than the mean value for males, there was no statistically significant difference (P> 0, 05) (Table 10).

Sex	No. of Animal Examined	Mean	Std.err	Std.dev
Female	173	293.0636	15.39426	202.4799
Male	56	346.4284	42.25497	316.2072
Total	229	306.1135	15.57858	235.7467

t =-1.4761, P=0.1413

Table 10: Comparison of mean EPG between sexes (two – sample t-test with equal variance).

In the clinical survey, an overall prevalence rate of 67.53% was observed in sheep brought to Debre Berhan Veterinary clinic. There was a significant difference in prevalence (P<0.05) among different sites from where the animals come. This may be due to differences in bionomic factors in the study area. There was also a significant variation on the basis of sex i.e. they were equally susceptible to fasciolosis among sex basis (Table 6).

In the case of abattoir survey, an overall prevalence rate of 96.67% was recorded in DebreBerhan Municipal Abattoir. There was no significant difference (P>0.05) in prevalence rate on the basis sex. The result indicates that both female and male equally susceptible to the liver flukes.

Conclusion and Recommendations

In general, it can be concluded that fasciolosis is one of the major obstacle for livestock development in the study area by inflicting remarkable direct and indirect losses at different parts of the country where its occurrence is closely linked to the presence of biotypes suitable for the development of snail intermediate host. In that area the result of present study and that of other previous indicate that fasciolosis still one of the major health problems of animals in DebreBerhan region. An overall fasciolosis infection prevalence rate of 48.21% was recorded in examined samples. There was an overall prevalence rate of 57.79% which was found during clinical survey and 96.67% is large enough in abattoir survey. As a result great economic loss due to fasciolosis in study area. Therefore, to minimize the loss due to infection epidemiological based strategies control is recommended.

Based on the local condition prevailing in the study area the following points are recommended:

- Improving of basic animal management system i.e. housing ,watering as well as grazing management must be practiced
- To control fasciolosis strategic anthelmintic treatment of the ruminants and control of reproductive potential of intermediate host (snail) by using locally available mollicides and anthelmintics.
- Since fasciola causes great economic losses the government should pay attention the problem to control the distribution of disease by financial support and distribution of anthelmintics to the farmers where the disease is endemic.
- Creating and further consolidation of farmer's awareness is necessary.

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