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Research Article

Prevalence and associated risk factors of fasciolosis and paraphistomosis in sheep in and around Batu town

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Abstract

A cross sectional study was conducted from November, 2015 to April, 2016 in an around Batu town, East shoa Zone Oromia regional State, Ethiopia. A total of 384 fecal samples from Sheep were collected and examined. Out of this 105 sheep (27.3%) were found to be infected at least by one parasite species. Among a total of 384 examined sheep fecal samples, 86 samples were found positive for Fasciola eggs with an overall prevalence of 22.4%. The prevalence of fasciolosis recorded in the four Peasant Associations (PAs) were 18.8%, 25%, 29.2% and16.7% in Edo Kontola,Worja- Woshgula and Batu respectively. In this study ovine fasciolosis shows statistically significant difference on age, body condition and history of deworming ($p<0.05$). The difference in Peasant Associations and sex were not statistically significant ($p>0.05$). Out of 384 coprological examinations, the prevalence of Paramphistomosis was 8.6%, whereas prevalence of paraphistomosis recorded in the four Peasant Associations (PAs) were 8.3% 8.3%, 12.5% and5.2% in Edo Kontola,Worja-Woshgula and Batu respectively. The prevalence of paraphistomosis was not statistically significant in sex, history of deworming ($p>0.05$). The difference in prevalence among age, body condition was statistically significant. ($p<0.05$). The co- infestation of two parasites was tried to be seen and their prevalence were 4%, 4%, and 2% in Edo kontola, Worja-Woshgula and Batu respectively. Prevalence of co-infection were statistically insignificant in relation to peasant association, sex and dewormed history of animals ($P>0.05$). The prevalence of co-infestation statistically significant difference based on age and body condition animals ($p<0.05$). The relative high prevalence indicated lack of strategic control measures against the diseases and related to the wide marsh areas at grazing site of animals. Strategic anthelmintic treatment with appropriate drugs and reduction in the risk of infection should be upgraded among society.

INTRODUCTION

Ethiopia has the largest livestock population in Africa, which plays an important role in the lives of its people. It owns huge number of small ruminants, about 26.1 million sheep and 21.7 million goats [1]. Small ruminants play a significant role in maintaining household stability by providing meat, milk, skin and wool, generate cash income and play traditional social and religious roles [2], Even though the productivity is low as a result of disease, malnutrition and other management problems. Parasitism is one of the major bottle necks to livestock development in the tropics [3]. Fascioliasis and Amphistomosis (Paramphistomosis) are two important parasitic diseases of farm livestock [4]. Among many parasitic problems of farm animals, fasciolosis caused by Fasciola hepatica and F. gigantica, is one of the most prevalent helminthes infections of ruminants in different parts of the world including Ethiopia. Sheep and cattle are the most important definitive hosts of F. hepatica and F. gigantica. They are responsible for wide spread morbidity and mortality in sheep and cattle characterized by weight loss, anaemia, hypoproteinaemia and unthriftiness. It causes a substantial economic loss which includes; death, loss in carcass weight, reduction in milk yield, condemnation of affected liver, decline production and productive performances, predispose animals to other disease and cost of treatment expense. Both F. hepatica and F. gigantica type of liver flukes cause severe loss in parts of Ethiopia where suitable ecological conditions for the growth and multiplication of intermediate host snails are found [5].

In Ethiopia F. hepatica and F. gigantica infections occur in areas above 1800 meter above sea level and below 1200 m.a.s.l respectively which has been attributed to variations in the climatic and ecological conditions such as rain fall, altitude, temperature and livestock management system [6]. Diagnosis is based primarily on clinical signs and seasonal occurrence in endemic areas. But previous history of fasciolosis on the area or identification of snail habitats; post mortem examinations, hematological tests and examination of faeces for fluke eggs are useful. Coprological analysis is still commonly employed to

diagnose fasciolosis despite the fact that eggs cannot be detected until after the latent period of infection, when much of the liver damage has already occurred.

Besides its great veterinary importance throughout the world, fasciolosis has recently been shown to be a re- emerging and wide spared zoonosis affecting a number of human populations [7].

The presence of fasciolosis due to *F. hepatica* and *F. gigantica* in Ethiopia has long been known and its prevalence and economic significance have been reported by several workers. But, Amphistomosis is still a neglected helminthes infection in many countries and the parasites are sometimes considered to have no effect on animals including in Ethiopia. However, this infection is one of the major obstacles for livestock development and causing direct and indirect substantial economic losses to livestock industry and is widely spread and reported in ruminants of different parts of Ethiopia especially in areas having water logged and marshy grazing fields. Their occurrence is closely linked to the presence of biotypes suitable for the development of snail intermediate hosts.

The species particularly Paramphistomum epiclitum, P. cervi, Gastrothylax crumenifer, Gigantocotyle explanatum, Cotylophoron cotylophorum and Fischoederius elongatus were found to be predominant in domestic ruminants. The stomach fluke has a complex life cycle which requires snail intermediate host for completion of its life cycle. Adult paramphistomes are small flukes about 1 cm long, conical in shape and pink or a reddish color mainly parasitic in the fore stomachs (Rumen, reticulum) of ruminants [8] Their early stages are in small intestine and then migrate through the abomasum towards the rumen and reticulum.

The major epidemiological variable influencing worm burdens of animals is the infection rate from pastures. It is also influenced by the climatic requirement for egg hatching, development and survival of the larvae in pasture. Even though the prevalence of ovine fasciolosis and paraphistomosis are investigated in different parts of Ethiopia; yet there is no well documented research that shows prevalence of ovine fasciolosis, paraphistomosis and its associated risk factors in and around Batu (Zeway) town. Therefore the objective of this paper is to determine prevalence of ovine fasciolosis and paraphistomosis and to assess some associated risk factors of the diseases

MATERIALS AND METHODS

Description of Study Area

A cross sectional study was conducted from November, 2015 to April, 2016 in an around Batu town, East shoa Oromia regional State, Ethiopia. Batu is a town and separate woreda in central Ethiopia. It is located on the road connecting Addis Ababa to Nairobi in the East shoa zone of the Oromia region of Ethiopia. Batu is located at latitude and longitude of 7o56‟N38o43‟E and with an elevation of 1643 meters above sea level. It is about 163km away from Addis Ababa in south east direction. Batu has a total area of about 8000ha, which has been subdivided into 4 urban kebele (least administrative structure) administrations. The economy of Batu town is based on small trade, fishing,and horticulture. According to ATARDO, 2015/2016 report there are 163520 heads of Cattle, 27021 heads of Sheep, 82230 heads of Goats,31212 heads of donkeys, 5380 heads of horse, 1305 heads of mule and 114571 heads of Poultry in Adami tulu jiddo kombolcha districts

Study Population

The study populations were sheep of all age group, both sexes with different history of deworming and body condition in and around Batu town. Study animals were managed under traditional extensive system and depend mostly on grazing marshy area around Lake in and around Batu town and receive a minimum or no supplementary feed and health care. Then individual animal age, species, sex category, body condition and history of deworming was recorded.

Study Design

A cross-sectional study was conducted to determine prevalence and associated risk factors of ovine fasciolosis and Paramphistomosis in and around Batu town. Individual animals were selected using simple random sampling method from selected peasant associations and arranged according to their age, sex and body condition, history of deworming and origin.

Sampling and sample size determination

To calculate the total sample size, the following parameters was used: 95% level of confidence (CL), 5% desired level of precision and with the assumption of 50% expected prevalence of Fasciola and Paramphistomum, the sample size was determined using the formula given in Thrusfield.

$$n = \frac{1.96^{*2} P_{exp} (1-P_{exp})}{D^2}$$

Where: -n= sample size; pexp= expected prevalence; d= desired absolute precision. Therefore, based on the above formula the total sample size of sheep was calculated to be 384.

Study Methodology

4.5.1 Coproscopy: Faecal samples for this study were collected directly from the rectum of each animal in to clean universal bottle. Each sample was labled with age, sex, body condition, history of deworming and origin. Then these faecal samples were subjected to qualitative coprological examination using sedimentation technique. For the trematodes egg identification a drop of methylene blue was added [9].

Data Analysis

Data obtained from coprological examination was recorded on Microsoft exel and analyzed using SPSS version 20 statistical package. Descriptive statistics were used to determine prevalence of Fasciola and paraphistomum infection in sheeps in and around Batu(ziway) town and Logistic regressions were used to know the significance and to calculate degree of association between risk factors with fasciola and paraphistomum parasite. All statistical tests were conducted using SPSS version 20 software and were considered significant if the p value is less than 0.05.

RESULTS

In this study, a total of 384 fecal samples from Sheep were examined and 105 sheep (27.3%) were found to be infected at

least by one parasite species. Taking peasant association, sex, age and deworming history as a predisposing risk factor, it was observed that sheep from different origin shows different prevalence for the parasites, but statistically it was insignificant (p>0.05). Higher prevalence of these trematode parasites was observed in female, adult, poor body condition and non-dewormed sheeps (p<0.05). Females were infected about 1.8 times than males (OR=0.547), Adults about 2.3times than young's (OR=2.263) and non-dewormed were infected about 2.3 than young (OR=2.345). (Table 1).

Among a total of 384 examined sheep fecal samples, 86 samples were found positive for Fasciola eggs with an overall prevalence of 22.4% (Table 2). The prevalence of fasciolosis recorded in the four Peasant Associations (PAs) were 18.8%, 25%, 29.2% and 16.7% in Edo Kontola, Worja- Woshgula, and Batu respectively. As indicated in Table 2 and this difference in prevalence was not statistically significant (p>0.05).

Influence of age on the prevalence of ovine fasciolosis revealed that there was higher prevalence rate (27.5%) in adult and lower prevalence rate in animals of young aged (16.7%). There was statistically significant difference on the prevalence of ovine fasciolosis based on age (p<0.05) as indicated in table 2.

The prevalence of fasciolosis in male and female sheep was 18.3% and 25.5%, respectively. Although the prevalence was relatively higher in female sheep as Indicated in table 2. The difference was not statistically significant (p>0.05). Prevalence of ovine fasciolosis on poor body condition animals was 28.8%. However, animals with good body condition showed prevalence of 17.6%. As described in Table 2. Significant difference (P < 0.05) was observed among body condition of the study animals.

An attempt was also made to analyze the prevalence with respect to deworming history of the animals. The prevalence of the disease in animals that were not dewormed (28.1%) was higher than dewormed (12.7%) sheeps. The result of statistical analysis revealed significant difference (P < 0.05) in history of deworming (Table 2).

Out of 384 coprological examinations, the prevalence of Paramphistomosis was 8.6%, the prevalence of paraphistomosis recorded in the four Peasant Associations (PAs) were 8.3% 8.3%, 12.5% and 5.2% in Edo Kontola, Worja-Woshgula and Batu respectively. As indicated in Table 3. This difference in prevalence was not statistically significant (p>0.05).

The prevalence of paraphistomosis in male and female sheep was 5.5% and 10.9%, respectively. Although the prevalence was relatively higher in female sheep as indicated in Table 3. it was not statistically significant (p>0.05). Prevalence of paraphistomosis in adult was higher in adult than young, and there were found to be 12.3% and 4.4% respectively. The difference in prevalence among age group was statistically significant. (p<0.05). Prevalence of ovine paraphistomosis in poor body condition animals was 13.5 % which is higher than animals with good body condition which showed prevalence of 5%. The difference in body condition was statistically significant. (p<0.05).sheep with poor body condition were almost three times infested than sheep with good body condition. (OR=3.337). The Prevalence of ovine paraphistomosis based on deworming history was, 9.5%, and 7% for none dewormed and dewormed respectively. Although there was slight difference among them it was statistically in significant (p>0.05).

The co-infestation of two parasites was tried to be seen and their prevalence were 4%, 4% and 2% in Edo kontola, Worja-Woshgula and Batu respectively. The presence of co-infestation of the two parasites was slightly higher in females (4.1%) than males (3%). The peasant association and sex are statistically insignificant (P >0.05) the prevalence of co-infestation was higher in adult (5.9%) and lower prevalence rate was observed in animals of young aged (1.1%). And there was statistically significant difference on the prevalence of co- infestation based on age (p<0.05). Prevalence of co- infestation on poor body condition animals was 7.4%. However, animals with good body condition showed prevalence of 0.9%. As described in Table 4. Significant difference (P < 0.05) was observed among body condition of the study animals. Animals with poor body condition were highly infested than animals with good body conditions.

Table 1: Overall prevalence of trematode parasites.

variable	Category	No of examined	No of Infested	Prevalence (%)	OR	95%CI FOR EXP	P- Value
	Edo kontola	96	22	22.9	1.351	(0.651,2.802)	0.09
	Worja	96	28	29.2	1.975	(0.973,4.008)	
PAs	Woshgula						
	Batu	96	19	19.8	ref		
Sex	Male	164	34	20.7	0.547	0.332,0.903	0.018
	Female	220	71	32.3	ref		
	Adult	204	69	33.8	2.263	(1.379,3.715)	0.001
Age	Young	180	36	20	ref		
Body condition	Poor	163	57	35	2.051	(1.264,3.327)	0.04
	Good						
	Non dewormed						
	dewormed	242	80	33.1	2.345	(1.373,4.003)	0.002
Deworming history	Total	142	25	17.6	ref.		
		384	105	27.3			

Table 2: Prevalence of ovine fasciolosis based on associated risk factors.

variable	catagory	No of examined	No of infes ted	Prevalence %)	OR	95%CI FOR EXP(B)	P- Value
PA	Edo kontola	96	18	18.8	1.251	(0.577,2.712)	0.058
	Worja- woshgula	96	24	25	1.985	(0.943,4.176)	
	Bochessa	96	28	29.2	2.474	(1.192,5.136)	
	Batu	96	16	16.7	ref		
Sex	Male	164	30	18.3	0.677	(0.401,1.143)	0.144
	Female	220	56	25.5	ref.		
Age	Adult	204	56	27.5	2.051	(1.216,3.458)	0.007
	Young	180	30	16.7	ref.		
Body condition		384	86	22.4	ref		
	Poor	163	47	28.8	1.94	(1.166,3.229)	0.011
	Good	221	39	17.6	ref		
Deworming history	Non	242	68	28.1	2.718	(1.511,4.891)	0.001
	dewormed						
	dewormed	142	18	12.7	ref		
	Total	384	86	22.4			

Table 3: Prevalence of paraphistomosis based on risk factors.

variable	catagory	No of examined	No of affected	Prevalence (%)	OR	95%CI FOR EXP(B)	P-Value
PAs	Edo kontola	96	8	8.3	2.024	(0.612,6.693)	0.174
	Worja woshgula	96	8	8.3	1.891	(0.572,6.249)	
	Batu	96	5	5.2			
	Male	164	9	5.5	0.477	(0.209,1.090)	
	Female	220	24	10.9	ref		0.079
Sex	Adult	204	225	12.3	3,316	(1.419,7.749)	
Age	Young	180	8	4.4	ref		0.0006
	Poor	163	22	13.5	3.337	(1.524,7.306)	
Body condition	Good	221	11	5			0.003
	Non dewormed	242	23	9.5	1.278	(0.570,2.868)	
Deworming history	dewormed	142	10	7	ref		0.551
	total	384	33	8.6			

Table 4: Prevalence of co infestation base on associated risk factors.

variable	catagory	No of examined	No of infested	Prevalence (%)	OR	95%CI FOR EXP(B)	P-Value
PAs	Edo kontola	96	4	4.2	2.62	(0.443,15.494)	0.602
	Worja woshgula	96	4	4.2	2.841	0.478,16.	
	batu	96	2	2.1			
	Male	164	5	3	0.843	(0.261,2.724)	
Sex	Female	220	9	4.1			0.775
	Adult	204	12	5.9	6.552	(1.409,30.476)	
Age	Young	180	2	1.1			0.017
	Poor	163	12	7.4	9.949	(2.141,46.227)	
Body Condition	Good	221	2	0.9			
	Non dewormed	242	11	4.5	2.042	(0.533,7.8332)	
Deworming history	dewormed	142	3	2.1	ref.		0.298
	total	384	14	3.6			

The prevalence of co- infestation based on deworming history was also tried to be seen and in non-dewormed sheep's it was found to be 4.5% and 2.1% in dewormed sheep's. Although non dewormed sheep's were highly co- infested than dewormed animals the difference was statically insignificant (p>0.05) as indicated in table 4.

DISCUSSION

Trematode parasitism is one of the major problems lowering ruminant productivity around the world (Vercruysse, and E. Claerebout, 2001) [10] In Ethiopia, the rich potential from livestock sector has not been efficiently and fully exploited due to several constraints like malnutrition, traditional management practice, poor genetic makeup and prevailing diseases. Among the prevailing diseases in the country, trematodes are reported to be one of the main parasitic problems of cattle and other ruminants (Malone,and Yilma, 1998) [6].

In the present study, a total of 384 fecal samples from Sheeps were examined and 105 sheep (27.3%) were found to be infected at least by one parasite species. Parasitological examination of fecal samples collected from 384 sheep revealed an overall fasciolosis prevalence of 22.4% in the study area. This finding was in agreement with [11] who reported prevalence of 24.2 % in Alamata sub districts. The overall prevalence of ovine fasciolosis in this study was higher than the previous studies done by Ahmed et al.(2007), [11] Henok and [13] who reported the prevalence of 13.2% and 14.6% in Awash and Hirna, respectively. While, it was lower than the one reported by [14] in Kemisse (49%), [15] in Adigrat (39.5%)and [16] in oda bultum district(45.6%). This might be due to the differences in temperature, moisture, humidity, soil and other ecological factors of the study areas that could favor or disfavor the snail intermediate host and the parasites as well as the effort exerted towards the control of the parasite [17].

Prevalence of fasciolosis in the different PAs of the study areas were no statistical difference (p> 0.05). It might be due to similarity of the altitude and other ecological conditions. Where, Yilma and Malone suggested altitude to be one of the determinant factors for the difference in distribution of fasciolosis.

In this study Prevalence of fasciolosis with regard to sex was 18.3 % and 25.5.2% in male and female animals respectively. The difference was not statistically significant (p>0.05) that prevalence of fasciolosis was not significantly different between male and female sheep may indicate that that sex of the animals has no impact on the prevalence because both sexes are allowed to graze and equally exposed to the infection. This idea is agreed with [10, 17-19].

The present study indicated that an infection rate of fasciolosis was significantly (P<0.05) higher in adults than young sheep and the adult sheep were infected twice as young sheep (OR=2.051). This was in consent with [18] [11] [19]. The lower prevalence rate in young might be due to the management system of sheep in the study area where they are not allowed to go far with adults for grazing hence reducing the chance of exposure to infective larvae of fasciola worm. More over higher risk of adult might be due to physiological differences including stress, pregnancy and nutritional imbalances [12].

In the present study, higher infection rate of fasciolosis was recorded in sheep with poor body condition than good body condition animals. The prevalence was statistically significant (P<0.05). Similarly [14] also reported significantly higher prevalence in sheep with poor body conditions than in those with good body condition. This signified the importance of fasciolosis in causing weight loss. And this could be due to the fact that animals with poor body conditions are usually less resistant and are therefore susceptible to infectious diseases [21].

Evaluation of infection prevalence in dewormed and non-dewormed sheep revealed that the non-dewormed sheep were found to be more susceptible to fasciolosis than dewormed sheep. This might be due to the reduction of worm burden by effective anthelmintics. However, re-infection was observed among dewormed sheep groups due to presence of irrigation canal and very large marsh area used for grazing [11].

Parasitological examination of fecal samples collected from 384 sheep revealed an overall paraphistomosis prevalence of 8.6% in the study area. This finding was in agreement with [22] who reported prevalence of 7.06 % in Egypt. The overall prevalence of ovine paraphistomosis in this study was higher than the previous studies done by [23] who reported 0.78% in Haramaya While, it was lower than the one reported by yohannes in tigray(23.7%), in Debrezeit (28.9%).This might be due to the differences in temperature, moisture, humidity and other ecological factors of the study areas that could favor or disfavor the snail intermediate host

In this study, the prevalence of ovine paramphistomosis in different peasant association was assessed. The finding showed no significant variation (p>0.05) among the different peasant association. As there was drought in the study area the the animals from different area graze large grazing land surrounding the Lake ziway and due to this reason they might be equally exposed to the larvae of paramphistomum.

According to the current study sex related susceptibility to ovine paramphistomosis indicated both sexes have equal chance to be infected with the rumen fluke. This fact is also supported by previous author [24].

The prevalence of ovine paramphistomosis was proved be higher 12.3% in adult sheep than young sheep 4.4%. There was statistically significant difference (p<0.05) in the prevalence of paramphistomosis with respect to the age of ovine. This result is in agreement with Melaku and Addis [25] and [26]. This may be due to the fact that adult sheep graze for longer period of time in the marshy area and young sheep are housed.

In the present study, higher infection rate of paraphistomum was recorded in sheep with poor body condition than good body condition animals. The prevalence was statistically significant (P<0.05). This could be due to the fact that animals with poor body conditions are usually less resistant and are therefore susceptible to infectious diseases [21].

The prevalence of the paraphistomum in sheep that were not dewormed was higher than dewormed sheep .The result of statistical analysis revealed significant difference (P > 0.05) in history of deworming. This might be due to absence of effective

drugs for paraphistomum and this may result insignificant variation among dewormed and non-dewormed sheep.

In this study the prevalence co- infestation of two parasites were, 4%,4%,4% and 2% in Edo kontola, Worja- Woshgula, Bochessa, and Batu respectively. But no significant difference was found among animals based on their peasant association (P >0.05).It might be due to grazing area they use in common which may enable them to access larvae of both parasites.

In the study no significant variation in prevalence of co infestation was found between female and male. This might be due to co infestation is not sex based.

The present study indicated that an infection rate of co infestation was significantly (P<0.05) higher in adults than young sheep. This may be due to the fact that adult sheep graze for longer period of time in the marshy area and the chance of getting the larvae of both parasites is high while young sheep are housed.

In the present study, higher prevalence of co infestation was recorded in sheep with poor body condition than good body condition animals. The prevalence was statistically significant (P<0.05). This could be due to the fact that animals with poor body conditions are usually less resistant and are therefore susceptible to infectious diseases [21].

The non-dewormed animals showed higher prevalence of co infestation than adult ones, however, the variation was not statistically significant (p>0.05). This might be because of both dewormed and non-dewormed animals have the same chance being infected by both parasites.

CONCLUSION

The result of the present study indicated that fasciolosis was a highly prevalent sheep disease in the study area that could potentially hinder productivity of sheep and tremendously affect the rural economy at large .paraphistomosis is also another disease which should get consideration in the studied area and country at large because it is the major cause of economic loss though it does not get consideration. In this study,(age,body condition and deworming history),(age and body condition) and(age and body condition) were the most important risk factors for fasciolosis, paraphistomosis and co infestation respectively However, it is increasingly evident that a proper evaluation of the epidemiology of these trematode disease is lacking. The relatively high prevalence reported in this study has clearly indicated lack of strategic control measures against the diseases and also due to the wide marsh areas at grazing site of animals.

RECOMMENDATIONS

Based on the aforementioned conclusion the following recommendations are forwarded:

- Strategic anthelmintic treatment with appropriate fluck cidal drugs should be practiced to eliminate the fluke burden of the host and minimize the pasture contamination by fecal egg shedding, thus interrupting the life cycle.Reduction in the risk of infection by planned grazing management especially during high outbreak months by the application of zero grazing (cut and carry).
- The awareness about the paraphistomosis disease should be up graded among society.
- Further studies on epidemiology of ovine fasciolosis and paraphistomosis should be conducted on the study area. Finally the farmer should be well educated and informed about importance of the disease control programmes and good management system.

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