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Prevalence of Ovine Fasciolosis and its Associated Risk Factors in Toke Kutaye District, West Shewa Zone, Ethiopia

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Abstract: Fasciolosis is one of the most prevalent trematode helminth infections of ruminants in different parts of the world. A cross-sectional study was conducted to estimate the coprological prevalence of ovine fasciolosis and to assess its associated risk factors at Toke Kutaye district, Ethiopia from November 2022 to June, 2023. In this study sheep from three peasant associations (Naga File, Gudar, and Emala Jawe) were involved regardless of their age group, sex, and body condition. Fecal sample examination was performed on a total of 384 sheep those selected using simple random sampling method for coprological investigations by using sedimentation technique. Out of these sheep 80 (20.8%) were positive for *Fasciola* eggs. Based on origins of animals, the highest prevalence rate was recorded in Gudar 44(23.16%), followed by Naga File 18(18.18%), and Emala Jawe 18(18.95%) with no statistically significant difference (P>0.05). The current finding revealed comparatively higher prevalence in male 66(27.0%) than in female 14(10.0%) animals with statistically significant association (P<0.05). In addition, the highest prevalence of fasciolosis was observed in poor body condition sheep 39(32.5%), followed by medium 33(23.7%) and good body condition sheep 8(6.4%). Analysis of age wise prevalence of fasciolosis indicated the presence of relatively high infection rate in young animals 47(24.1%) than the adults groups 33(17.5%) with no statistically significant variation (P>0.05). According to the final multivariate analysis, male sheep were 4 times more likely to be affected with fasciola than female sheep (P =0.00; OR =4.09; CI=2.105-7.954) and poor body condition sheep was 7 times more likely to be affected with fasciola than good body conditions sheep (P=0.00, OR=4.142, CI=1.803-9.513). In conclusion ovine fasciolosis were identified as one of prevalent causing major economic losses in the study area, sex and body conditions was identified as the associated risk factors for the occurrences of fasciolosis. Therefore, control strategies targeted on the parasite and the intermediate host as well as implementation of appropriate grazing management in the study area is warranted and further research surveys are recommended to strengthen the result for better understanding on the epidemiology of ovine fasciolosis in the study area.

Key words: Coprological · Fasciolosis · Ovine · Risk Factors · Toke Kutaye

INTRODUCTION

Ethiopia has an extremely diverse topography, a wide range of climatic features and a multitude of agro-ecological zones that are suitable to host a very huge animal population [1]. The country has the largest livestock population in Africa with estimated domestic animal more than 60.4 million cattle, 31.3 million sheep, 32.7 million goats, 1.41 million camels, 56 million poultry, 2 million horses, 0.46 million mules and 8.8 million donkeys [2]. They play vital roles in generating income to farmers, creating job opportunities, ensuring food security, contributing to social, cultural and environmental values and sustain livelihoods. However, the contribution from these huge livestock resources to the national income is insignificance due to several factors. Among prevalent diseases, parasitosis represents a major health problem hampering livestock productivity in tropics [3].

Fasciollosis is one of the major constraint factors for ovine production development in Ethiopia by inflecting direct and indirect loss at different parts of the country.

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Fasciollosis, also known as distomatosis or liver fluke disease, is an important neglected parasitic zoonosis [4]. The most common species are *F. hepatica* in temperate regions and *F. gigantica* in tropical countries [5]. The disease is widely distributed globally and affects humans and a wide range of wild and domestic ruminants causing severe losses [6].

Ovine Fasciollosis is an economically important parasitic disease of sheep caused by trematodes species of the genus Fasciola, which migrate in the hepatic parenchyma and establish and develops in the bile ducts. The snails of the genus lymnae are mainly involved as an intermediate host in the life cycle of Fasciollosis. This Fasciola disease has three phases of clinical sign acute, sub-acute and chronic forms. Acute Fasciollosis occurs as disease outbreak following a massive, but relatively short-term, intake of metacercariae. Death usually results from blood loss due to hemorrhage and tissue destruction caused by the migratory juvenile flukes in the live resulting in traumatic hepatitis[6].

Diagnosis of fasciolosis may consist of tentative and confirmatory procedures. A tentative diagnosis of fasciolosis may be established based on prior knowledge of the epidemiology of the disease in a given environment, observations of clinical signs, information on grazing history and seasonal occurrence. Confirmatory diagnosis; however, is based on demonstration of Fasciola eggs through standard examination of feces in the laboratory; postmortem examination of infected animals and demonstration of immature and mature flukes in the liver. For chronic fasciolosis, confirmatory diagnosis could easily carried out by coproscopic examination employing sedimentation technique. Fasciola eggs have high specific gravity and sedimentation is preferred to floatation [7].

Treatment of infected animals will largely depend on the correct use of appropriate and registered anthelmintic. Triclabendazole is the most effective anthelmintic drug which can be destroys or kills all stage of Fasciola. Fasciolosis may be controlled by reducing the populations of the intermediate snail host, or by appropriate anthelminthic treatment and the population of snail should be destroyed by applying Molluscicide and destroying the environment that suit for snail's reproduction [8].

In Ethiopia, the annual losses due to ovine fasciolosis were estimated at 48.4 million Ethiopians per year, of which 46.5%, 48.8%, and 4.7% were due to mortality, productivity (weight loss and reproductive wastage), and liver condemnation at slaughter, respectively[9]. Apart from its great veterinary importance throughout the world, F. hepatica has recently been shown to be a re-emerging and widespread zoonotic agent, affecting numerous human populations in the world [10]. The prevalence of fasciolosis in sheep has not been conducted so far in the Toke Kutaye district. The disease is insufficiently investigated, and information relating to its magnitude, distribution, and risk factors is scant. Therefore, the present study was undertaken with the general objective to:

- To estimate the prevalence of ovine fasciolosis Toke Kutaye, West Shewa zone
- To assess the associated risk factors of ovine fasciolosis in Toke Kutaye District.

MATERIALS AND METHODS

Descriptions of the Study Area: The study was conducted in Toke Kutaye District which is located in West Shoa Zone of Oromia Regional state, Western Ethiopia starting from December, 2022 to June, 2023. Geographically, Toke Kutaye District, Guder town was located at 8°56'30" to 8°59'30" N latitude and 37° 47'30 to37°55'15" E longitude with an elevation of 2387meters above sea level (m .a.sl) and 126 km west of Addis Ababa. The agro ecology of the study area is 27% highland, 55% midland, and 18% lowland. It has an annual rainfall and temperature ranging from 800-1100mm and 16 to 29°C respectively. The rainfall is bi-modal with the short rainy season from February to May and long rainy season from June to September. The population of the district was a total of 354, 604 livestock populations: 145, 410 cattle; 47, 349 shoats; 14, 245 donkeys; 27, 600 horses; 3, 000 mule and 117, 000 poultry [11].

Study Animals and Sampling Technique: Study population comprises of indigenous ovine of different body condition, sex and age category found under the extensive grazing system. Simple random sampling technique was the sampling strategy used to collect all the necessary data from fecal samples of the study animals.

Study Design: A cross- sectional study was carried out from November, 2022 to June, 2023 to estimate the prevalence of ovine fasciolosis and to compare the detection rate of fasciola infection using direct examination, sedimentation and floatation techniques.

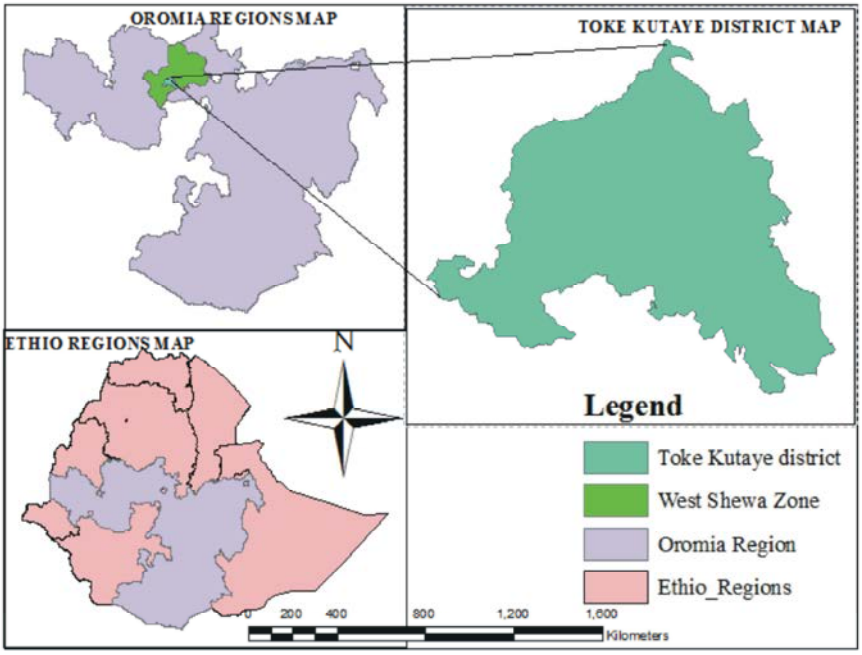

Fig. 1: Map of study area created using Arc GIS software from Ethiopian GIS

Sampling Method and Sampling Size Determination: Simple random sampling method was subjected to the study population. The total number of Ovine required for the study was calculated based on formula given by Thrusfield [12]. By rule of thumb where there is no documented information about the prevalence of ovine fasciolosis and compare three methods of diagnosis in and around Guder town; 50% prevalence with a 5% desired level of precision and 95% of confidence interval was used. Using this formula, the sample size needed in this study was 384.

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

where,

n = required sample size
Pexp = expected prevalence
d = desired level of precision at 95% confidence interval

Study Methodology: Fecal sample was collected directly from the rectum of each animal using glove or freshly defecated feces with strict sanitation for sheep with different age and sex group and the sample placed in air and water tight vials preserve within 10 % formalin and taken to the Ambo University Guder Mamo Mezemir Campus Veterinary parasitology Laboratory. In the laboratory the sample was subjected to flotation technique, direct smears and sediment techniques for the identification of egg of parasite.

Sedimentation technique was used to detect the presence or absence of fluke eggs in the fecal sample collected [13]. To differentiate between eggs of *Paramphistomum* and *Fasciola* species, a drop of methylene blue solution was added where eggs of *Fasciola* species show yellowish color while eggs of *paramphistomum* species stain by methylene blue [14].

Data Management and Analysis: The data which collected from the study area, result obtained from fecal examination was recorded in the format developed for this purpose and entered in to Microsoft Excel spread sheet. Data analysis was made using Statistical Software used: SPSS version 22. The significant association between the prevalence of Ovine fasciolosis and explanatory variables were determined using Chi-square. The prevalence of fasciolosis was calculated by using percentage values and possible association of disease with risk factors was analyzed by using Chi –Square test and predictive value (P-Value).

RESULTS

Overall Prevalence of Ovine Fasciolosis: From the total of 384 examined bovine fecal samples, overall of

80 (20.8%) sample were positive of *Fasciola* eggs using sedmentation techniques. Of the samples collected 99, 190, and 95 samples were collected from Naga File, Gudar and Emala Jawe villages, respectively. Out of the samples collected from Naga File 18(18.18%), Gudar 44(23.16%), and Emala Jawe 18(18.95%) of them were positive for Fasciola eggs. The result indicated that the highest coprological prevalence of fasciolosis was recorded in animals came from Gudar PAs as compared to that of the rest. However, there was no statistically significant difference ($p>0.05$) among these peasant associations (Table 1).

Coprological Prevalence Based on Associated Risk Factors

Sex: Among the 384 animals sampled, the majority 244 (63.5%) was males while the others 140 (36.5%) of them were females. The prevalence rates of fasciolosis was 14(10.0%) and 66(27.0%) in female and male, respectively (Table 2). There was statistical difference ($p<0.05$) between both sexes.

Age Groups: Analysis of age wise prevalence of fasciolosis showed that the difference in prevalence between the two age groups were relatively high in young group 47(24.1%) than the adult age groups 33(17.5%). The result showed that young animals were more affected than adult with no statistical significance ($p>0.05$) (Table 3).

Body Condition: The highest and lowest infection rate of bovine fasciolosis was recorded within poor 39(32.5%) and good body condition 8(6.4 %) animals respectively. The rate of this disease in medium body condition animal was 33(23.7%). The prevalence of bovine fasciolosis on the basis of body condition showed statistically significant difference ($p<0.05$) as indicated below (Table 4).

Results of Multivariable Logistic Regression Analysis: All variables was (origins, age, sex and body conditions) underwent multivariable logistic regression analysis and fitted to the model. Accordingly, fitting a multivariable

Table 1: Overall prevalence of ovine fasciolosis in the study sites

Variables	Categories	No animal examined	No +ve animal	Prevalence (%)	χ^2	P-Value
Site	Naga File	99	18	18.18	1.249	0.535
	Gudar	190	44	23.16		
	Emala Jawe	95	18	18.95		
Overall	-	384	80	20.8		

Table 2: Overall prevalence of ovine fasciolosis in terms of sex

Variables	Category	No of animal examined	No positive animal	Prevalence (%)	χ^2	P-Value
Sex	Male	244	66	27.0%	15.678	<0.001
	Female	140	14	10.0%		
Overall		384	80	20.8%		

Table 3: Overall prevalence of ovine fasciolosis in terms of age

Variables	Categories	No animal examined	No +ve animal	Prevalence (%)	χ^2	P-Value
Age	Young	195	47	24.1	2.567	0.109
	Adult	189	33	17.5		
Overall	-	384	80	20.8		

Table 4: Overall prevalence of ovine fasciolosis in terms of body condition

Variables	Categories	No animal examined	No of +ve animal	(Prevalence (%)	χ^2	P-Value
Body condition	Poor	120	39	32.5	26.404	<0.001
	Medium	139	33	23.7		
	Good	125	8	6.4		
Overall	-	384	80	20.8		

Table 5: Results of the multivariable logistic regression model for the predictors of prevalence of fasciolosis in Toke Kutaye districts

Variables	Categories	Tested number	Positive Number (%)	OR(95% CI)	P- value
Sex	Female	140	14(10.0)	Ref	<0.001
	Male	244	66(27.0)	4.09(2.105-7.954)	
Body conditions	Good	125	8(6.4)	Ref.	<0.001
	Medium	139	33(23.7)	4.142(1.803-9.513)	
	Poor	120	39(32.5)	7.32(3.181-16.848)	

regression model revealed that among the risk factors considered in the analysis, the sex and body conditions of the sheep were associated with prevalence of fasciola in the study area. Whereas the effects of origin and age on disease prevalence not statistically significant. The results showed that male sheep were 4 times more likely to be affected with fasciola than female sheep (P = 0.00; OR = 4.09; CI = 2.105-7.954). Likewise Poor body condition sheep was 7 times more likely to be affected with fasciola than Good body conditions (Table 5).

DISCUSSION

Fasciola infections are of major concern worldwide. Fasciola species are pathogens that cause severe disease in animals and humans when ingested via contaminated feeds/ foods with the infective stages of the parasite. Hence, the surveillance of the prevalence is vital for the protection of the animal health, public health and consumer interests. Production of healthy animals also has important economic implications in an increasingly competitive global market [15]. The present study was designed to assess the prevalence and identify risk factors associated with ovine fasciolosis in Toke Kutaye district.

The overall prevalence of ovine fasciolosis in the present study based on fecal examination was found to be 20.8%. The findings nearly agree with previous studies by Dejene [16] who reported the prevalence as 26.56% in and around Holeta. This may be due to the similarity of the climatic conditions and geographical regions, such as rainfall, altitude, temperature, and humidity. This result was also nearly the same with Henok [17] with a prevalence of 14.6% in Hirna district of Oromia regional state. However, the current findings were lower than the reports of Michael [18] with reported prevalence rates of 56.3% for ovine fascioliasis in the Upper Awash River Basin. These differences in the prevalence of ovine fasciolosis in different regions of the country may be due to the variation of the climatic conditions such as altitude, rain fall, temperature, humidity and management system of the sheep. Moreover, the difference in prevalence and severity of the disease syndrome is evident in various geographical regions depending on the local climatic conditions, availability of permanent water, and system of management [19, 20].

The high infection rates of fasciolosis were observed in Guder 44(23.16%) followed by Naga File peasant association 18(18.18%) while the lowest infection rates were observed in Emala Jawe peasant association with the same prevalence 18(18.95%) by using sedimentation techniques [21]. This result shows that Guder is considered to be the high risk areas for fasciola infection and Naga File and Emala Jawe are considered to be low risk areas for fasciola infection. However, no statistical variations in the prevalence of fasciolosis between the origins of animals and prevalence were may be due to the same geographical location and ecology of the areas which determine the survival of the snail host of fasciola. The findings of the present study were disagreed with the works of Azene [22] who reported the significant difference of the prevalence between origins of the animals.

There was no statistically significant difference ($p>0.05$) in prevalence between young and adult age groups of sheep and the prevalence is 47(24.1%) in young and 33(17.5%) in adult. These may be due to both of the age groups have similar exposure to ingest the infective stage of the parasite (metacercaria) during grazing i.e. there is no great gap between the young and adult age groups. Even if it is insignificant, the prevalence young group is more affected than adult as the age increases the level of infection decreases [23 , 24]. This is certainly the fact that adult animal have repeatedly exposed to fluke infection than young's and develops resistance. The findings of the present study in terms of the age factor were inconsistent with the findings of Rahmeto [25] in selected sub-Districts of Alamata, Ethiopia.

The prevalence of fasciolosis under coprological examination was found to be 32.5%, 23.7% and 6.4% for poor, medium and good body condition respectively. The prevalence was highest in poor body conditioned sheep. Analysis on the prevalence of fasciolosis in relation to body condition of animal showed statically difference (High prevalence is in animals of poor body condition this might be due to the animal was unable to resist the infection. Similar to the current study, Bitew [26] also reported a significantly higher prevalence in sheep with poor body conditions than in those with good body conditions in Dawa-Cheffa, Kemissie, Ethiopia. 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 [27].

The occurrence of the disease across the sex factor showed that there was significant statistical difference ($P<0.05$) between male and female sheep. This result was agreed with observations made by Dejene [16] who recorded 32.24% in males and 22.84 in females in and Around Holeta Town, Central Ethiopia. However, this finding contradicts the findings of Rahamato [25] and Tilahun [27] who concluded that the sex had no impact on

the infection rate and hence both male and female were equal susceptible and exposed to fasciolosis. The statistical significant difference in the prevalence of fasciolosis between sex factors in the current study might be attributed to management system with large exposure of male out door when females were kept in door at the beginning of lactation [28-30].

CONCLUSION AND RECOMMENDATION

In the present study the prevalence of ovine Fasciolosis which was found to be high indicated that Fasciolosis is one of the major disease that cause immense economic losses and the major obstacle for livestock development in Ethiopia. The age and origin of animals was statistically associated with the prevalence of fasciola in the study area. This study confirmed that there was significant difference in the prevalence of fasciolosis among the different sex and body condition score of examined sheep and it shows that fasciola parasites were more prevalent in poor body condition animals than medium and good body condition animals and the prevalence was high in male sex groups than female sheep. Therefore based on the above conclusive remarks the following recommendations were forwarded:

- Strategic application of anthelmintic, eliminating the parasite from the host at the most appropriate time for effective prevention of pasture contamination and coupled with reduction of the number of intermediate host, snails by chemicals, drainage and other management practice.
- Awareness creation to animal owners regarding the route of infection and economic importance of the disease so that they can actively participate in the control of the disease and Coproslogical examination should be repeated and supported by other diagnostic methods.
- Further coproslogical investigation in wide geographical areas and large sample size are needed for better understanding on the epidemiology of Ovine fasciolosis in the study area.

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