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Study on Prevalence and Risk Factors of Ovine Fasciolosis on Shirka District, Arsi Zone, Eastern Ethiopia

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Abstract

A cross sectional study was conducted to determine the prevalence and risk factors of ovine *fasciolosis* in and around Shirka Woreda, East Arsi, South East of Ethiopia from February 2021 to June 2021. Parasitological examination of fecal samples collected from 327 sheep by using sedimentation method. The samples from these animal examinations 140 were positive with an overall *fasciolosis* prevalence of 42.81%. The results demonstrated in three climatic conditions that fasciola infection was higher in highland, midland and lowland with 54.43, 39.48 and 33.33 respectively, but there was no statistical significance (p>0.05). The prevalence of ovine *fasciolosis* for the different age groups were found to vary with non-significant difference (p>0.05) and infection rate between male and female sheep were found non-significant (p>0.05). Infection rates for sheep with good body condition (46.01%) were higher than sheep with medium body condition and poor body condition (43.12% and 32.73% respectively). There was no significant difference (P>0.05) for body condition. The result of the present study indicated that *fasciolosis* is a highly prevalent sheep disease in the study area that could potentially hinder productivity of sheep and tremendously affect the rural economy at large. To control the disease in this area, appropriate preventive control strategies have to be designed to reduce the impact of the disease on sheep production.

Keywords: Ovine *fasciolosis*; Prevalence; Risk factors; Shirka district

Introduction

Ethiopia possesses the largest livestock population in Africa, with an estimated population of 7.8 million equines, 1 million camels, 47.5 million cattle, 39.6 million chickens, 26.1 million sheep and 21.7 million goats [1]. In Ethiopia, sheep are the dominant livestock providing up to 63% of cash income and 23% of food subsistence value obtained from livestock production. Endo-parasitic infection and management problems are known to be the main factors that affect productivity. The various species of gastrointestinal and pulmonary nematodes, trematodes and cestodes are known to be prevalent in Ethiopia [2]. Parasitic diseases are the common infections that affect productivity in small ruminants Tesfaheywet [3]. Vast number of parasitic diseases is incriminated to play a harmful effect for production of small ruminants leading to serious economic loss [4]. *Fasciolosis* is one of the important parasitic diseases in tropical and subtropical countries which limit productivity of ruminants [5]. The disease is caused by digenean trematodes of the genus *Fasciola* commonly referred to as liver flukes. *Fasciola hepatica* and *Fasciola gigantica* are the two liver flukes commonly reported to cause *fasciolosis* in ruminants [6]. The clinical features of *fasciolosis* can have acute, sub-acute and chronic forms [7]. The snails of genus *Lymnaea* are mainly involved as an intermediate host in the life cycle of *Fasciola* [8]. *Fasciolosis* have public importance when infectious metacercariae are ingested with contaminated water or raw or undercooked vegetables. During their larval stage, immature flukes migrate through the liver producing an acute febrile syndrome some weeks after infection, followed by a chronic-latent stage which may last for years or decades. Acute *fasciolosis* is characterized by fever, high eosinophilia and hepatosplenomegaly. At this stage, ova are usually not yet produced [9]. Liver fluke infection in lambs and kids is characterized by anemia, edema, weight loss and death [10]. The re-emergence or emergence of *fasciolosis* in certain countries can be explained by the recent evolution of human activities, such as the building of irrigation systems, livestock management, the use of unsafe water and raw vegetable consumption [11]. Fascioliasis is an economically important zoonotic disease of domestic livestock, especially cattle, buffalo, sheep, goat, horse, donkey, rabbit, wild ruminant and also in human. The disease is caused mainly by two species of parasitic Trematodes that affect the liver and other associated organs. The disease is caused by digenean trematodes of the genus Fasciola, commonly referred to as liver flukes. Liver flukes belong to the group of food borne Trematodes infection and are zoonotic [12]. Ovine *fasciolosis* in Ethiopia is very frequent and causes a significant economic loss in production, decrease productivity and loss of body condition and the annual losses were estimated at 48.4 million 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 at slaughter respectively. Annual economic loss caused by the disease is mainly due to mortality (mild to heavy), cost of diagnosis treatment and condemned liver [13] reduced milk yield, fertility disorders and reduced meat production [14]. The incidence of the disease has increased in the last few years as a possible consequence of changes in the global climate. Future predictions also suggest that this trend is likely to continue [15].

Therefore, the objectives of this study were:

- To know the prevalence of ovine *fasciolosis* in selected rural kebeles.
- To generate base line data for future research.

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Materials and Methods

Study area

The study was conducted from February 2021 up to June 2021 in Shirka district, which found in south Eastern Oromia regional state in Arsi zone and is located 265 km south East of Addis Ababa. The average temperature is 18°C which varies between 10°C to 25°C with an annual average rain fall of around 1000 mm. Its altitude is between 1500-3400 m with an average altitude of 2450 m above mean sea level.

Study populations

The study animals comprised of 327 indigenous sheep of local breeds belonging to the three selected areas that are lowland, midland and highland and consisting of various ages, sexes and season with regard to the prevalence of ovine *fasciolosis*.

Study design

A cross sectional study was conducted from February 2021-June 2021 in Shirka district to determine the prevalence of *fasciolosis*. Simple random sampling method was employ to select the study population. During sample collection; all necessary risk factors related to ovine *fasciolosis* were properly recorded such as; age, sex, body condition and districts of sheep.

Sampling method

Simple random sampling method was employed to select the study population. During sample collection; all necessary risk factors related to ovine *fasciolosis* were properly recorded such as; age, sex, body condition and districts of sheep.

Sample size determinations

Indigenous sheep kept under traditional extensive management system were used for the study and distributed in different groups according to the body conditions, sex and age. The sample size was determined according to the formula given by Thrusfield with 95% Confidence interval and 5% absolute precision [16].

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

Where, N=Sample size;

P_{exp} = Expected prevalence;

D= Absolute precision;

$$\text{Then, } N = \frac{(1.96)^2 . 0.307(1-0.693)}{(0.05)^2}$$

N = 327, because there is research studied at the area and the overall prevalence was 30.7% we use for research as expected prevalence.

Sample collection method

Fecal samples were collect directly from sheep and placed in sampling bottles and preserved in 10% formalin and potassium dichromate. The samples were taken to Asella regional laboratory after labeled with animal identification, age, sex, owner name and site of sample collection.

Laboratory technique

Fresh fecal samples for parasitological examination were collected directly from the rectum by using disposable plastic gloves and placed in clean universal bottles. Each sample was labeled with date of submission, age, sex, climate condition and place of origin (Woreda). Sedimentation technique was used to detect the presence or absence of fluke eggs in the fecal sample collected according to Urquhart [17].

Data analysis

Data obtained from coprological examination was recorded on Microsoft exel and the coded data in the excel work sheet were analyzed by using SPSS version 20 software. Descriptive statistics were used to determine prevalence of Fasciola infection in ovine in Shirka district and chi-squre test was used to assess for the presence of association of risk factors with the prevalence of the parasite. All statistical tests were conducted using SPSS version 20 software and were considered significant if the p value is less than 0.05. Microsoft excel work sheet were used to store all the collected and examined data by entering with appropriate code of variables before analysis.

Results

Over all prevalence from a total of 327 examined sheep fecal sample of the three PA Table 1 of Shirka district, 140 samples were found positive for fasciola eggs with in an overall prevalence of 42.81%. The prevalence of *fasciolosis* recorded in the three associations (PAs) were highlands (30.71), midlands (65.71) and lowlands (3.58). There were no statically significance differences between the prevalence of fasciola eggs in the different study sites (P>0.05).

Prevalence of ovine fasciolosis based on three PA

Out of 327 faecal samples examined an overall prevalence of 140 (42.81) were found positive for *faciolosis* in the study area. The prevalence of *faciolosis* not varied significantly among the three areas. But the highest prevalence of *fasciolosis* was recorded in highlands (54.43) followed by midlands (39.48) and the lowest is lowland (33.33). Statistical analysis revealed that there was no significant difference (P <0.05) in *fasciolosis* among areas.

Prevalence of ovine *fasciolosis* based on body condition score

Prevalence by body condition score groups of animals; the infection rate between poor, medium and good animals were compared. It was observed that the prevalence of *fasciolosis* was significantly higher in good (46.01%) and lower in medium (43.12) and poor (32.73) animals.

Prevalence of Ovine *fasciolosis* based on age

Prevalence by age groups of animals; the infection rate between young and adult animals was compared. It was observed that the prevalence of *fasciolosis* was significantly higher in adult (62.86%) than young (37.14) animals.

Prevalence of Ovine *fasciolosis* based on sex

Although the prevalence was relatively higher in female (44.58%) sheep than in male sheep (37.93%). The difference was not statistically significant (P>0.05)

Table 1: Prevalence of ovine fasciolosis based on three PA.

PA	No of sheep Observed	No of sheep positive	X2(P-value)	Df
Highland	79	43	5.959 (0.051)	2
Midland	233	92		
Lowland	15	5		
Total	327	140		

Discussion

The result of the study showed that the distribution of 327 ovine examined for *fasciolosis* by age, 122 (37.31%) ovine examined were young, 205 (62.69%) were adult and the distribution of ovine examined for *fasciolosis* by sex, 87 (26.6%) animals were found male and 240 (73.4%) female. In this study, the overall prevalence of ovine *fasciolosis* was 42.81%. It was lower than previous report of Mohammed [18], which was reported to be 49.7% in Kombolcha; Molalegn et al. [18] reported 49.1% in and around Dawa-Cheffe, Kemissie and Michael [19, 20] who reported 56.3% from upper Awash River basin. The present study was also greater than past findings on the same study area which reported as 30.7% Megerssa et al [21]. This difference may be due to parasite resistance to antihelmintics, lack of seasonal deworming and excessive exposure to marshy area which is the site of parasite multiplications. According to statistical analysis of infection rates based on site, the lowest prevalence rate (23.3%) was recorded at So do reported 13.2% prevalence in the Awash River basin which was the lowest prevalence rate as compared to the aforementioned findings. The variation in prevalence among the different studies might be due to differences in climatic condition and agro-ecological zone for the development of the snail intermediate hosts [22]. The reason may also be seasonal fluctuation, level of nutrition, method of diagnosis and decreasing trend of animal deworming by farmers. This might be associated with the apparent inability of the host to resistant disease and vulnerable to parasitic disease. In this study, sex did not show significant variation on the prevalence of *fasciola*, similar finding was shown by Daryani et al. [23]. The prevalence of the disease in female and male animals was recorded as 44.58% and 37.93% respectively which were slightly higher in female animals than in male (Table 2). Similar results that support the present finding were reported by Molalegne et al. [13]. There was non-significant difference (P>0.05) between the two sex indicating that sex seems no more effect on the prevalence of the disease. This may be due to the fact that *fasciolosis* is not a disease directly related to animal reproductive system and grazing of both sex groups in similar pasture land. In this study, the prevalence of *fasciola* was found different among climatic conditions. The highest *fasciola* prevalence was in highland which was 54.43%, while the lowest prevalence was in lowland which was 33.33%. These differences in prevalence among the three climatic conditions were not statistically significant (P>0.05) (Table 3). Similar result that supports the present finding was reported by Ahmad et al. Jarso [13,24]. These might be due to the difference in temperature, moisture, humidity and soil that might affect the multiplication of intermediate host snails [25]. However, an accurate description of seasonal occurrence requires long-term epidemiological investigation over several years. Adult animals showed higher prevalence than younger ones (Table 4), however, the variation as not statistically significant (P>0.05). Similar results that support the present finding were reported by Hubad et al. [26-29]. This could be due to the fact that young animals are not allowed to go far with adult animals for grazing/feeding reducing the chance of exposure to infective metacercaria as compared to adults.

Table 2: Prevalence of Ovine fasciolosis based on sex.

Sex group	No of sheep Observed	No of sheep positive	X2(P-value)	Df
Female	240	107	1.154 (0.283)	1
Male	87	33		
Total	327	140		

Table 3: Prevalence of ovine fasciolosis based on body condition score.

Body score	No of sheep Observed	No of sheep positive	X2(P-value)	Df
Good	163	75	2.971 (0.226)	2
Medium	109	47		
Poor	55	18		
Total	327	140		

Table 4: Prevalence of Ovine fasciolosis based on age.

Age group	No of sheep Observed	No of sheep positive	X2(P-value)	Df
Adult	205	88	0.957 (0.957)	1
Young	122	52		
Total	327	140		

Conclusion and Recommendations

The result of the present study indicated that *fasciolosis* is a highly prevalent sheep disease in the study area. However, it is increasingly evident that a proper evaluation of the epidemiology of *fasciolosis* is lacking. The relatively high prevalence reported in this study has clearly indicated lack of strategic control measures against the disease as well as poor veterinary services. The study has investigated the prevalence of ovine *fasciolosis* in Sherka Woreda Arsi, Ethiopia in three climatic conditions and found overall prevalence of 42.81%. It was noted that *fasciolosis* was relatively higher in the sheep with good body condition score than their counterparts that could potentially hinder productivity of sheep and tremendously affect the rural economy at large.

Based on above mentioned conclusion the following recommendations are forwarded:

- Integrated approach, which is a combination of selective chemotherapy and selective vector control, should be considered more practically and economically feasible.
- Supplementation of important nutrient feed in dry season is important to avoid stress conditions that affect the host resistance and susceptibility to parasitic diseases.
- Training need to be organized to farmers with economic significance and control methods of this disease in the study area.
- Studies on the epidemiology of *fasciolosis* in order to expand and implement disease investigation and control strategy should be conducted Strategies aimed at deworming in the study areas have to be implemented to minimize the effect of *fasciolosis* in sheep.

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