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Prevalence of Fasciolosis in sheep and goats in Urban and Peri-Urban areas of Bishoftu, Oromia region, Ethiopia

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Abstract

Fasciolosis is one of the most common widespread parasitic diseases of domestic livestock particularly in cattle, sheep and goats. A cross sectional study was conducted from December, 2021 to September, 2022 in sheep and goats to determining the prevalence and risk factors associated with fasciolosis in Urban and Per-urban areas of Bishoftu, Oromia regional state, Ethiopia. Out of 384 sheep and goats randomly sampled in the study area, 228 sheep and 156 goats were examined for fasciolosis by using sedimentation technique to find out the egg of fasciola parasite. The data analysis by SPSS version 16 and descripitive statistics for association were analyzed. An overall prevalence of fasciolosis of examined animal in the study area was 31.51%. Among the samples 35.09%) from sheep and 26.28%) from goats were detected positive for fasciolosis. Among the risk factor considered in this study the study revealed that no statistically significant difference ($p > 0.05$) was found in prevalence between Sex, origin, species and age of examined animal. Body condition of the animals were showed statistically significant difference ($p<0.05$). The Sex prevalence was 32.34% and 29.57% in male and female animals respectively while that of age was 33.22% and 25.64% in adult and young animals respectively. Body condition score infection rate was 44.21%, 28.57% and 6.25% in poor, medium and good body conditions respectively. According to the origin of animals also revealed that there were not statistically significant ($p > 0.05$) in the five study sites. This study indicated that fasciolosis were among the series health problem both in sheep and goats in the study area. Therefore, effective strategic treatment and public awareness creation should be instituted in the study area.

Keywords: Bishoftu, Fasciola, Goats, Sheep, Oromia

1. Introduction

Fasciolosis is one of the important parasitic diseases in tropical and subtropical countries which limit productivity of ruminants (Mulatu and Addis, 2011).The disease is classified as a neglected tropical disease (NTD). In Ethiopia, small ruminants have been used either for local meat consumption as well as source of foreign currency by exporting animal and animal products. However, the resource associated with the small ruminants production are not fully exploited due to several factors including occurrence of recurrent drought, infrastructures

problem, rampant animal diseases, poor nutrition, poor husbandry practices, shortage of trained man power and lack of policies for disease control and prevention (ILRI, 2009). Ethiopia possess 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 goat (CSA, 2009).

The main two liver flukes species causing Fasciolosis, *Fasciola hepatica* and *Fasciolagigantica*, are hermaphrodites and they live mainly in the bile duct and gall bladder of infested animals. The two species have a common life cycle and are associated with severe damage to the infested body organ (Mahami*et al*., 2012). Fasciolosis is a waterborne and foodborne disease caused by two parasites of class Trematoda genus *Fasciola.* Humans are incidental hosts and become infected by ingesting contaminated watercress or water (Harbir*et al.*, 2019).

Ethiopia is the second most populous country in sub-Saharan Africa. Sheep serve as a major means of livelihoods of poor livestock keepers, and there by contribute to poverty reduction. In some areas, small ruminants are described as the “village bank”. Parasitism is one of the major bottlenecks to livestock development in tropics (Menkir*et al*., 2007). Fasciolosis is perceived as a significant animal health problem by the mobile pastoralist population in the south-eastern Lake Chad area (Jean *et al.*, 2011).

Among diseases which are not often apparent to farmers, the liver fluke infections are considerable economic and public health importance. Fasciolosis, largely caused by *Fasciola hepatica* in temperate climates and by *Fasciolagigantica* in tropical regions, is characterized by sudden death with blood stained froth at the natural orifices in acute cases (Garry *et al*., 2007). While diarrhea, jaundice, ascites and bottle jaw are predominant features in chronic cases (Ahmadi and Meshkehkar, 2010).

Parasitic infection and management problems are known to be the main factors that affect productivity and the various species of gastrointestinal and pulmonary nematodes, trematodes and cestodes are known to be prevalent in Ethiopia (Zgabeher*et al*., 2012). Sheep fasciolosis in Ethiopia is very frequent and causes a significant economic loss in production, decrease productivity and loss of body condition due to mortality, productivity and liver condemnation at slaughter respectively and loss due to fasciolosis is associated with mortality, reduced growth rate, reduction in weight gain and unthriftiness, condemnation in large number of infected livers, increased susceptibility to secondary infection and expense due to control measure (Molalgne*et al*., 2010).Even though several studies were so far conducted on the prevalence of fasciolosis and associated risk factors, in view of the prevailing global climate change it deems necessary to see the current status of this disease in sheep and goats.The objectives of the current study were [1] To determine prevalence of fasciolosis in sheep and goats[2] To assess major risk factors associated with occurrence of fasciolosis in sheep and goats in the study area

2. Materials and Methods

2.1. Study Area

The study was conducted in Bishoftu from December 2021to September 2022.Bishoftu is a town located in the East Shewa Zone of the Oromia Region, Ethiopia, and has an elevation of 1,920m and located 47.9 km southeast of Addis Ababa along its route four high way. The town is located at 9 ^{0}N and 40^{0} E.The main rainy season extending from June to September and a short rainy season from March to May with an average annual rainfall of 800mm. The mean annual minimum and maximum temperatures are 12.3°C and 27.7°C, respectively, with an overall average of 18.7°C. The mean relative humidity is 61.3%. In the town, there are 160,697 cattle, 22,181 sheep, 37,510 goat, 5660 horse, 38,726 donkey, 268 mule and 191,380 poultry (CSA, 2008).

The livestock production system in the area is both intensive and extensive type. It is a resort town, known for its several lakes. The majority of

the inhabitants said they practiced, Ethiopian Orthodox Christianity, with 79.75% of the population reporting they observed this belief, while 13.82% of the population were Protestant, and 4.98% of the population were Muslim. The city is home for the National Veterinary Institute of Ethiopia, established in 1963 the leading veterinary vaccine research and production center currently producing more than 20 livestock vaccines. Next door to the national veterinary institute is the school of veterinary medicine of Addis Ababa University (CSA, 2004). Other major businesses in Bishoftu include the Adaa flour and Pasta Factory, Leather Products Manufacturing and Women Youth Children Development Programme (Shaughnessy *et al.*, 2018).

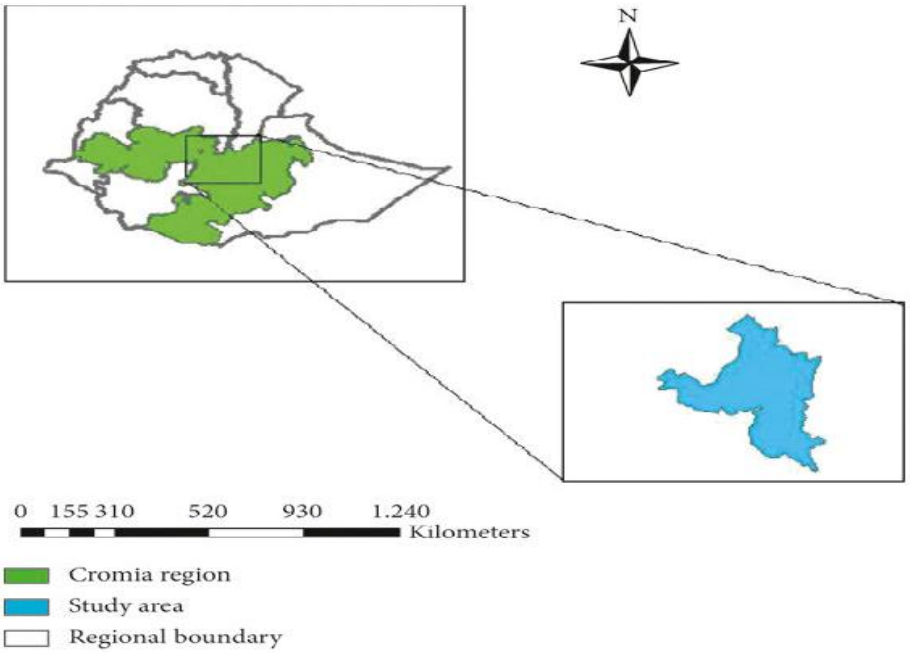

Figure 1:Map of Bishoftu town
Source: Abunna*et al., (2018).*

2.2. Study population

The study populations for the study were sheep and goats in and around Bishoftu town and categorized based on their body condition, sex, species and age.

2.3. Study Design and Period

The cross sectional study was conducted from December 2021 to September 2022.To determine the prevalence of sheep and goats fasciolosis and to assessing associated risk factorsin study area and to assess the community knowledge on disease in urban and peri-urban areas of Bishoftu town. All greasing local sheep and goats were randomly sampled and fresh fecal sample was collected. Animals brought to veterinary Teaching Hospital of CVMA were also randomly sampled.

2.4. Sampling Method and Sample size determination

Simple random sampling technique was the sampling strategy used to collect all the necessary data from fecal samples of the study animals. The sample size for the study was calculated using the formula given by Thrusfield, (2005). For calculating the required sample size, 95% Confidence Interval (CI) and 5% absolute level of precision was used. Since there was no previous study conducted on sheep and goats fasciolosis in the study area, expected prevalence was taken 50%

$$N=1.96^2 \times p\ (1-p)/d^2$$

Where n=required sample size
d=desired absolute precision 0.05,
Pexp=expected prevalence 50%

Based on the above formula, the required sample size was 384

2.5. Study Methodology

Sample Collection procedure

Fresh fecal samples were collected directly from the rectum and immediately taken in to CVMA, veterinary parisitology laboratory for examination. In the laboratory, fecal sample was screened for the presence of fasciola egg using sedimentation technique. While collecting the fecal samples, body condition (good, medium and poor) sex, origin and age (young and adult) of sheep and goats was recorded.

Sedimentation Technique

In the laboratory, the sedimentation technique was used to detect the presence or absence fasciola eggs in the collected fecal samples (Bloeech, 2004). For examination, 3gm of feces was measured and put into mortal and crushed using pestle, 42ml of tape water was added and mixed with fork and filtered through a wire mesh sieve into a beaker. The filtered material was poured into a centrifuge tube and centrifuged at about 1500 rpm for five minutes. The supernatant were discarded and mixed the sediment well and take a small quantity of it using a pipette and bulb, were put on the clean slide, applied a cover slip and observed under a microscope (10x).

2.6. Data Management and Analysis

The raw data that was record on a Microsoft Excel spread sheet. The outcome variables for the study were analyzed using SPSS statistically Software the prevalence of the disease was determined while various potential risk factors and the independent variables for fasciolosisin both sheep and goats were analyzed by using SPSS version16 and descriptive statistics for associations were analyzed using the Chi-square-test(χ^2).

3. Results

3.1. CoprologicalPrevalence of Sheep and Goats Fasciolosis

Out of 384 fecal samples taken from sheep and goats the identification result showed on the Overall Prevalence of 31.51%. The specific prevalence of fasciolosis in these study was35.09% and 26.28% in sheep and goats respectively. Origin, species, Sex, age, and body condition score were considered as potential risk factors for the occurrence of fasciolosis in the study animals. The highest prevalence of fascilosis was observed in Hide (34.26%), Dukem and Dembi (33.33%) followed by Gendegorba (31.34%) while, the lowest was in Kaliti (25%. There was no significant difference ($p > 0.05$) on the prevalence of sheep and goats fasciolosis in different sites of the study area. The highest prevalence of fasciolosis was seen in sheep (35.09%). while the lowest prevalence was investigate in goats 26.28%. Statistical analysis showed no significant difference ($p > 0.05$) on the prevalence of sheep and goats fasciolosis in the two different species. Results revealed 29.57% fasciolosis for female animals and 32.34% for males but there was no Significance difference ($p > 0.05$) on the prevalence of fasciolosis between sex. 33.22% and 25.64% for adult and young animals respectively. There was no significant difference ($p > 0.05$) on the prevalence of sheep and goats fasciolosis in two different age groups. High infection rates of fasciolosis were observed in poor body condition animals (44.21%). In this study significant difference ($p < 0.05$) was observed on sheep and goats fasciolosis between the different body conditions of the examined animals.

Table 1: Prevalence of sheep and goats fasciolosis based on risk factors

Variable		Category	Number of examined	Number of positive (%)	Chi-square (p-value)
		Sheep	228	80(35.09)	
Species		Goat	156	41(26.28)	3.328(0.068)
Total			384	121(31.51)	
Sex	Male		269	87(32.34)	0.288(0.592)
Female			115	34(29.57)	
Total			384	121(31.51)	
Age	Adult		304	101(33.22)	2.579(0.275)
Young			80	20(25.64)	
Total			384	121(31.51)	
BCS	Good		16	1(6.25)	12.923(0.002)
Medium			273	78(28.57)	
Poor			95	42(44.21)	
Total			384	121(31.51)	2.149(0.708)
OriginKaliti			80	20(25%)	
Gendegorba			67	21(31.34)	
Dukem			69	23(33.33)	
Dembi			60	20(33.33)	
Hide			108	37(34.26)	
Total			384	121(31.51)	

4. Discussion

The overall prevalence 31.51% recorded in these study area and the result was in line with that finding by Dina and Henok, 2018, Gemechu and Gemeda, 2021,Abdulaziz, 2017, Samrawit and Mulat, 2015, Kindu*et al.*, 2019 and Abayneh and Seifu, 2020.who reported 32.02%, 32.8%, 34.8%, 35.68%, 33.9%, and 39.06% respectively.However, the current overall prevalence of sheep and goats fasciolosis in this study was much lower than the previous finding of Ashenafi*et al*., 2016, Michael, 2003, Molalgne*et al.*, 2008, Mukarim*et al*., 2019, Tadesse*et al.*, 2019a, Mebrate*et al*., 2019, Bogale*et al*., 2012), Tesfaheywet and Negash, 2012,Basaznew*et al.*, 2012, Chanie and Begashaw, 2012, Molalgne*et al.*, 2010 who reported 61%, 51%, 49%, 52.63%, 84%, 70.2%, 43.75%, 45.6%, 42.44%, 70.2%, 49%respectively. Which is higher than the present study.

In other way the current overall prevalence was higher than that of the overall prevalence of fasciolosis as Henok and Mekonnen, 2011, Abebe*et al*., 2018, Ahmed *et al.*, 2017, Mekuria*et al.*, 2014, Kedir*et al*., 2012,Abah*et al*., 2019,Tasawar*et al.*, 2007,Ahmed *et al*., 2007.Who reported 11.6 %, 16.3%, 17.88%, 9.8%, 9.4%, 6.19, 28.75% %, and 13.2% respectively. Which is lower than the present study.

The difference in the overall prevalence of fasciolosis may be due to the difference in presence of a favorable environment for the availability of the intermediate host, snails, where the study animals originated and the use of anthelmintics against fasciola in the study areas. Climate conditions, particularly rainfall, were frequently associated with difference in the prevalence of fasciola species infection because this was suitable for intermediate hosts like snails to reproduce and to survive longer period under moist conditions (Bowman, 2009).

In relation to host and management, traditional husbandry system, malnourished condition and immune suppression of the host, improper sanitation, ignorance of animal health problems contribute greatly for parasite and its vector growth, development and transmission in the environment. Generally, the variation of this infection in these areas might be due to the variation in agro-ecological condition, geographical variation, number of study samples, climatic conditions of the areas and it also be due to the improvement of veterinary services (Theodoropoulos, 2011).

The present study showed higher prevalence of fasciollosis in sheep (35.09%) was higher than goats (26.28%).There was no statistically significant difference (P > 0.05) between the two species. This signifies indicates species seems have no impact on the infection rate and both sheep and goats are equally susceptible and exposed to the disease. This might be due to nowadays, in most parts of Ethiopia goats had changed their feeding behavior from browsing to grazing on the same pasture along with sheep because of the shortage of browsing plants associated with bush clearing for expansion of crop agriculture and human settlement. This had resulted shows goats are exposed to infective larval stages of fasciola species to a similar level of infection as in sheep (Marquard*et al*., 2000). The result was agrees with finding of Dina and Henok, 2018 who reports 33.9% and 29.5% in sheep and goats respectively.This result did not agrees with previous finding of Abduleziz, 2017, Ashenafi*et al*., 2016,Kedir*et al*., 2012, Henok and Mekonnen, 2011,Abebe*et al*., 2018, Ahmed *et al.*, 2017, Mekuria*et al.,* 2014.

The prevalence of fasciolosis in the current study according to sex 87(32.34%) in males and 34 (29.57%) in females. There was no statistically significant difference (p>0.05) in the prevalence of fasciolosis between the two sex groups. This signifies indicates that the sex of sheep and goats has no effect on the prevalence of fasciolosis. These animals expose to parasitic infection with equal rate and move in searching of food and water together, which expose to the same risk of infection. This result similar with finding of Abayneh and Seifu, 2020, Mukarim*et al*., 2019, Samrawit and Mulat, 2015, Kindu*et al.,* 2019, Mekuria*et al.,* 2014,Abebe*et al*., 2018, Henok and Mekonnen, 2011, Gemechu and Gemeda, 2021, Ashenafi*et al.,* 2016), Molalegne*et al.,* 2010) and Chanie and Begashaw, 2012 and also Ahmad *et al*., 2017).These result was did not agreement with previous results reported by Basaznew*et al.,* 2012, Abah*et al.,* 2012, Abdulaziz, 2017, and Ahmed *et al.,* 2007).

This signifies sex seems have no impact on the infection rate and both male and females are equally susceptible and exposed to the disease. However, some workers found higher prevalence rate in the male than female and justification were related to management system with longer exposure of males outdoors when females are kept indoors at the end of pregnancy and at the beginning of lactation (Chekol and Girma, 2018). And some are found higher prevalence rate in the female animals are more prone to fasciola infections than male animals. This might be due to the difference in management system of male and female animals in the study area and adult males are mostly kept around homestead for fattening purpose in the study area (Basaznew*et al.,* 2012).

This study was also carried out on prevalence of sheep and goats fasciolosis based on body condition score was 44.21%, 28.57% and 6.25% in poor, medium and good body condition respectively was recorded. There was statistically significant difference (p < 0.05) in the prevalence of fasciolosis between the three categories of body condition. The results of this finding indicated that infection rates in poor body condition animals were higher than that of medium and good body conditions animals. These could be due to the animals with poor body condition are usually less resistant and are consequently susceptible to infectious diseases.

This finding result agrees with reported by Gemechu and Gemeda, 2021,Abebe*et al*., 2018, Ashenafi*et al*., 2016, Henok and Mekonnen, 2011, Molalegne*et al*., 2010, Basaznew*et*

al.,2012, Mekuria*et al.*, 2014, Samrawit and Mulat, 2015 and Ahmed *et al.*, 2007. These result was did not agreement with previous results reported Kindu*et al.*, 2019, Dina and Henok, 2018, Abduleziz, 2017 and Abayneh and Seifu, 2020. Who reports highest prevalence in poor body condition and the infection was statically significant.

The current prevalence of fasciolosis was found to be 101 (33.22%) and 20 (25.64%) in adult and young age groups respectively. Adult animals showed higher prevalence than younger ones however, the variation as not statistically significant (P > 0.05) between the two age groups. This indicates that all age groups have no impact on the infection rate. All age groups are equally susceptible to fasciolosis.

These might be due to grazing of young animals with the adults after some days of parturition. In some studies higher prevalence was recorded in the adults than young.These might be young animals are not allowed to go far with animals for grazing that they have reduced chance of exposure to infective metacercariae as compared to adults. Additionally, adult sheep were frequently graze and covers large area of grazing land than young that allows more chance of exposure to infestation (Shanko and Olgira, 2016). The higher risk of exposure of adult might be due to physiological differences, such as stress, pregnancy, lambing, inadequate nutrition, and infectious disease. Higher prevalence in younger animals possibly indicating that fasciolosis was hyper-endemic in area and animals get infection shortly after birth (Anjum*et al*., 2014).

The present finding was in harmonies with previous reported by Abebe*et al.*, 2018, Henok, 2018, Kindu*et al*., 2019, Mukarim*et al.*, 2019 and Abduleziz, 2017. There was no statistical significant difference (p > 0.05) were observed in prevalence among the age. These results was did not agree with reported by Gemechu and Gemeda, 2021, Abayneh and Seifu, 2020,Henok and Mekonnen, 2011 Ashenafi*et al.*,2016, Abayneh and Seifu, 2020, Basaznew*et al.*, 2012, Ahmad *et al*., 2017, Mekuria*et al.*, 2014, Molalegne*et al.*,2010,Samrawit and Mulat, 2015, Ahmed *et al*., 2007 and Abayneh and Seifu, 2020.There was statistical significant difference p < 0.05) were observed in prevalence among the age.

According to statistical analysis of infection rates based on origins, the lowest prevalence rate (25%) was recorded at Kaliti, while the highest rate (34.26%) was observed at Hide. These differences in prevalence among the five selected study sites were not statistically significant. This non-significant difference indicates that there is no difference in the prevalence of the disease among the origins of the animals.

This might be due to the similarity of agro-ecological and climatic conditions of the area such as rain fall and temperature (Ozard, 2006). Similar result that supports the present finding was reported by Mukarim*et al.*, 2019, Ashenafi*et al.*, 2016, Abdulazizi, 2017, Abebe*et al.*, 2018, Molalegne*et al*., 2010,Samrawit and Mulat, 2015, Kindu*et al.*, 201. Who reports prevalence in different origin with no statically significant (p > 0.05).These results did not agrees with reported by Henok, 2018, Henok and Mekonnen, 2011, Gemechu and Gemeda, 2021 and Ahmed *et al*., 2007 There was prevalence according to origin recorded statically significant (p < 0.05).

5. Conclusions and Recommendations

The present study conducted on sheep and goats fasciolosis from December, 2021 to September, 2022 in urban and peril – urban areas of Bishoftu. Conclude that fasciolosis is the most wide spread and prevalent parasitic disease affecting the health and productivity of animals. This study has investigated the overall prevalence of fasciolosis in sheep and goats 31.51% based on coprological examination by sedimentation technique. The prevalence of fasciolosis in this study is significantly associated (p < 0.05) with body condition. However, sex, species, origin and age were not significant with the prevalence of fasciolosis. High prevalence was record in poor body condition (44.21%).

Therefore, based on the above conclusion the following recommendations are forwarded:

✓ Animal should be kept in high level of nutrition to develop immunity against parasites.

✓ Strategic anthelminthic treatment with appropriate flukicidal drugs should be practiced to control the load of the parasites.

✓ Awareness should be created for owners about disease transmission methods.

✓ Drainage of swampy areas to reduce the snail population.

✓ Detailed studies should be conducted on the epidemiology of the disease.

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