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Abattoir study on Bovine Fasciolosis and Paramphistomosis and Associated Risk Factors at Bishoftu, Oromia Region, Ethiopia

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Abstract

Fasciolosis and paramphistomosis are two major economically significant trematode parasitic diseases of cattle in Ethiopia. A cross-sectional study was conducted to estimate the prevalence of fasciolosis and paramphistomosis and the associated risk factors in cattle slaughtered from December 2021 to May 2022 at Bishoftu municipal abattoir, Oromia, Ethiopia. From postmortem examination of a total of 400 bovine carcasses, the prevalence of bovine fasciolosis and paramphistomosis was 141(35.25%) and 83(20.8%), respectively. There was no statistically significant variation in the prevalence of bovine fasciolosis between the different breeds of animals in the four months from January to April, but there was a significant association of paramphistomosis in relation to breed. The prevalence was higher in the local breeds (36.8%) and lower in crossbreeds (25.9%) for fasciolosis. The prevalence of paramphistomosis in relation to breed was 78(22.8%) and 5(8.6%) in local and cross-breed animals, respectively. The prevalence of fasciolosis was higher in young (52, 49.1%) than in adult animals (89, 30.3%); but the prevalence of paramphistomosis in young animals was lower (16%) than in the adult group (22.4%). Infection rate of fasciolosis and paramphistomosis for cattle with poor body condition was 72.2% and 40.7% while for medium body condition was 37.4% and 28.7% and for good body condition, was 19.2% and 3.3%, respectively. The prevalence of fasciolosis according to the origins of cattle was highest in Bishoftu (42%) and for paramphistomosis it was highest in Modjo (27.4%) but lowest in Adama for both fasciolosis and paramphistomosis with the prevalence of 25.5% and 18.6% respectively. From 141 infected livers with *Fasciola* species, *Fasciola hepatica* was found to be the most prevalent species 72(51.1%), while the *Fasciola gigantica* and mixed infections were lower (with the prevalence of 31 (22%)

and 24 (17%), respectively). The findings of this study indicated that fasciolosis and paramphistomosis are still important parasitic diseases which affect livestock production and productivity by causing remarkable direct and indirect losses. Therefore, control strategies targeting both the parasites and the intermediate hosts are recommended in the study area.

Keywords: Abattoir, Bishoftu, Cattle, Fasciolosis, Paramphistomosis, Prevalence, Risk factors

Introduction

Ethiopia has the largest livestock population in Africa, that include 65 million heads of cattle,40 million sheep, 51 million goats, 8 million camels and 49 million chickens (Mekuriaw and Harris-Coble., 2021). Livestock has a significant influence on economy in different aspect of Ethiopian people life. This sector contributed up to 40% of agricultural Gross Domestic Product (GDP), nearly 20% of total GDP, and 20% of national foreign exchange earnings of Ethiopia (World Bank, 2017). The Ethiopian livestock population is almost entirely composed of indigenous animals. Recent estimates showed that 97.8%, 1.9%, and 0.3% of cattle are indigenous, hybrid, and exotic breeds, respectively (Mekuriaw and Harris-Coble., 2021).

Despite the large cattle population, productivity in Ethiopia is low due to poor nutrition, reproduction inefficiency, management constraints, and animal diseases (Alsan, 2012). Parasitism is a world-wide problem in livestock as well as in agricultural sector and responsible for major economic losses. The economic impact of these parasites on animals industry is great. The impact is greater in Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and types of helminthes. The most serious economic consequences of Helminthosis based on the overall number of worms, number of genera and species present, general levels of pathogenicity and widespread distribution (Rickard and Zimmerman, 1992). Helminthes parasite infections in cattle's are a primary factor in the reduction of livestock production and productivity (Wadhawa *et al*., 2011). It leads to a reduction in fertility, work capacity, reduction in food intake, weight, and milk production, and higher mortality rate (Rafiullah *et al*., 2011; Getachew *et al*., 2012).

Among many parasitic problems of domestic animals, trematodes (Fasciolosis and Paramphistomosis) are the most important parasitic diseases in domestic ruminants throughout the world (Constable *et al*., 2017). The geographical distribution of Trematode species is depending on the distribution of suitable species of snails. The genus *Lymnaea* in genera and water snail *planorbis* was reported to have a worldwide distribution (Urquhart *et al.*, 1996).

According to Solomon and Abebe (2007), bovine fasciolosis is the top parastic disease in Ethiopia's highland and lowland regions, having a big impact on animal production and productivity. It is caused by two liver fluke species, *Fasciola hepatica* and *Fasciola gigantica*, which are found in bile ducts and liver parenchyma of cattle (Titi *et al*., 2014). *Fasciola hepatica* (the highland) and *F. gigantica* (lowland) types of liver flukes cause severe economic losses in different parts of the country. It occurs in waterlogged and marshy grazing areas. Thus, the two *Fasciolid* species overlap in many Africa and Asian countries (Abebe *et al*., 2010). It is also highly prevalent in the highland and lowland areas of Oromia regional state (DACA, 2006). Because of the complex nature of the lifecycle and epidemiology of snail-borne disease presents challenges for predictive mapping at the herd-level, as well as disease management and animal husbandry at the individual-level (Walker *et al*., 2008).

The adult *Paramphistomum* in for stomach are essentially nonpathogenic even though large numbers may present (Titi *et al*., 2014). At most there may be a localized loss of rumen papillae. The immature worms attach to the duodenal mucosa by means of posterior suckers and causes severe enteritis possibly necrosis and hemorrhage. In heavy infestation a frank hemorrhage, duodenits, hypoproteinemia and edema may be produced with immature flukes deeply embedded in the mucosa. Severely affected animals exhibit unthriftness and diarrhea (Constable *et al*., 2017). There are two types of Trematodes: digenes and monogenes. Monogenetic trematodes have direct life cycle and are primary ectoparasite of aquatic vertebrate. Digenetic trematode have indirect life cycle and are endoparasite of a wide verity of vertebrate (Ballweber, 2001). The life cycle of these Trematodes involves snail as an intermediate host. The intermediate hosts for both *Fasciola hepatica* and *Fasciola gigantica* are snails of the family *Lymnaesidae*. *Lymnaea truncatula* is the most important and common intermediate host for *F. hepatica* and *Lymnaea natalensis*, which is the intermediate host of *F. gigantica* in different parts of Ethiopia (Graber, 1975), while All require a water snail as an intermediate host for Paramphistomum. Their shape is not typical of the trematodes, being conical rather than flat (Taylor *et al*., 2007).

Fasciola hepatica may reach a size of 2-3 cm by 1.3 cm. It is leaf shaped, broader anteriorly than posteriorly, with an anterior cone-shaped projection, which is followed by a pair of broad “shoulders” and the wide, darker, marginal zone of vitellaria is easily seen grossly. *Fasciola gigantica* may reach a size of 7.5cm long by 1.2cm wide. It differs from *F. hepatica* in being more evenly leaf-shaped, with scarcely perceptible shoulders or the shoulders are not prominent. These are only relative differential points, it is true, but the gross appearance of the long, straight- sided *F. gigantica* is nevertheless quite characteristic(Dunn., 1969).

Diagnosis is established based on prior knowledge of the epidemiology of the disease in a given environment; observation of clinical signs, information on grazing history, seasonal occurrence and standard examination of feces in the laboratory (Khan, 2005). More rational prophylactic programs based on local epidemiological information are needed for sound Fasciolosis and Paramphistomosis control strategies in Ethiopia (Yilmaand Malone, 1998).

Bovine fasciolosis prevalence in Ethiopia has been shown to range from 11.5% to 87%. (Malone et al., 1998). The most significant fluke species in Ethiopian livestock, F. hepatica, was found to be present throughout three-quarters of the country with the exception of the arid northeast and east. The distribution of F. gigantica was primarily confined to the western, humid region of the nation, which makes up about one-fourth of the entire country (Tadele Tolossa and Worku Tigre, 2007; Malone et al., 1998). Because of epidemiology of fasciolosis and paramphistomosis is dynamic and may change with years (Mungube *et al.*, 2006), it is important to monitor its development to determine trends in prevalence. And there is no recent published report about the magnitude of bovine fasciolosis and paramphistomosis that slaughtered at Bishoftu municipal abattoir.

Therefore, the objectives of this study were to estimate the prevalence of bovine fasciolosis and paramphistomosis in cattle slaughtered at Bishoftu municipal abattoir and to identify the major risk factors associated with the prevalence of these parasitic diseases.

Materials and Methods

Ethical approval

The abattoir owners were informed about the study and its objectives and granted verbal, fully informed consent. During the ante-mortem inspection, the study animals were handled according to standard protocols for animal use and care.

Study Area

The study was conducted from December 2021 to May 2022 at Bishoftu municipal abattoir, Oromia Region, Ethiopia. Bishoftu has an altitude of 1850 meter above sea level and experiences a bimodal rainfall pattern with a long rainy season from June to October and a short rainy season from March to

May. The average annual rainfall and averages maximum and minimum temperature of the area are 800mm, 26^0C and14^0C, respectively. The geographical (astronomical) location of Bishoftu town is approximately located at 8° 44' N latitude and 38° 57' E longitudes, 47 km South East of Addis Ababa at an altitude of 1950 meter above sea level (CSA, 2020).

Study design

A cross-sectional study was conducted from December 2021 to May 2022 to estimate the prevalence of fasciolosis and Paramphistomosis in cattle slaughtered at Bishoftu municipal abattoir using post mortem examination of liver and rumen of each selected animals and to investigate the major risk factors influencing the prevalence of bovine fasciolosis and paramphistomosis. The prevalence was estimated with respect to the number of risk factors such as host factors (age, breed, and body condition of the animals).

Study population

The study animals were only male indigenous (local) breeds of cattle of different ages brought to Bishoftu municipal abattoir for slaughter from Adama, Bishoftu, Dukam, and Modjo areas. Age was classified as young (< 4 years) and adult (>4years) (Cringoli *et al.*, 2002).

Sampling techniques and sample size determination

Systematic random sampling technique was the sampling strategy used to collect all the necessary data from abattoir survey of the study animals. The desired sample size was calculated using the standard formula described by (Thrusfield, 2018) with 95% confidenceinterval at 5% desired absolute precision and an expected prevalence was 21.6% (Regassa *et al.*, 2012). The estimated sample size was calculated by the formula by Thrusfield, (2018):

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

where, n = Sample size
p_{exp} = Expected prevalence (21.6%)
1.96 =The value of Z at 95% confidence level
d = Desired absolute precision (5%)
n = 260 animals

Hence, using the above formula, the sample size calculated was 260. However, to increase precision, the sample size was increased to 400.

Study Methodology

Active Abattoir Survey

Active abattoir survey was conducted based on cross sectional study during routine meat inspection on systematically selected cattle slaughtered in Bishoftu municipal abattoir, Ethiopia.

Ante-Mortem Examination

During ante mortem inspection each of the study animals was given identification with paint on their body and all the necessary independent variables such as age, breed, body condition score and origins of the animals were recorded. Prevalence was estimated through grouping the study animals in their body condition, age, breed, and origin. Body condition score of the animals was recorded by applying the procedure shown by (Nicholson and Butterworth, 1986). Accordingly, animals were classified into poor, medium, and good categories of body conditions. The animals examined was also grouped in to two age group (<5) as young and (>5) years as an adult by means of their dentition as described by (Lahunta and Habel, 1986).

Post- Mortem Examination

During postmortem inspection, the livers, rumen and reticulum from the previously identified animals were carefully observed and examined**.** The livers of slaughtered animals were examined by visual inspection, palpation and systematic incision to recover immature and adult flukes based on routine meat inspection guideline by Soulsby, 1982. The rumen and reticulum were also incised and opened and thoroughly examined to detect *paramphistomum* Species. The fluke burden count was conducted according to the approach of (Hammond and Sewell, 1972), as follows: the gall bladder was removed and washed to screen out mature flukes. The liver was cut into slices of about 1cm thick and put in a metal trough to allow mature flukes lodged in smaller bile ducts to escape and then the heads of the flukes were counted. Each mature fluke was identified to species level according to its shape and size and classified as *F. hepatica*, *F. gigantica*, mixed and immature forms of liver fluke according to the guide lines given by (Soulsby, 1982).

Statistical analysis

All information and data that was collected on fasciolosis and paramphistomosis of cattle and its risk factors during the period were entered to MS excel Sheet (2007) and analyzed using Stata version 15.0statistical analysis software (Stata Corp, 2017). Descriptive Statistics was used to determine the prevalence through percentage and frequency. The significance of association between and among the considered variables was determined using p-value, chi-square ($\chi 2$) test statistics. Association between variables was said to exist if the calculated level of significance is less than 5% ($p<0.05$) at a 95% confidence interval using Pearson chi-square ($\chi 2$) test statistics.

Results

Overall prevalence of Fasciolosis and Paramphistomosis

Out of 400 cattle slaughtered and examined at Bishoftu municipal abattoir, 141(35.25%) and 83(20.8%) animals were positive for fasciolosis and paramphistomosis respectively. The prevalence of fasciolosis and paramphistomosis according to the risk factors considered (breed, age, origin, body condition, and month) is presented in table 1and 2.

A statistically significant association was observed between the prevalence of fasciolosis and age, origin, body condition score, and month ($p <0.05$), but there was no statistically significant differences in the prevalence of fasciolosis with respect to breed ($p > 0.05$) (Table 1)

Table 1. Prevalence of fasciolosis based on breed, age, origins, and body condition of animals

Risk factors	Category	No. of examined	No. of positive	Prevalence (%)	χ^2	p-value of each risk factors
Breed	Local	342	126	36.8%	2.619	0.106
	Cross	58	15	25.9%		
Age	Adult	294	89	30.3%	12.045	0.001*
	Young	106	52	49.1%		
Body condition	Good	151	29	19.2%	49.779	0.000*
	Moderate	195	73	37.4%		
	Poor	54	39	72.2%		
Origin	Adama	102	26	25.5%	8.811	0.032*
	Bishoftu	138	58	42%		
	Dukam	98	31	31.6%		
	Modjo	62	26	41.9%		
Month	January	97	29	29.9%	9.669	0.022*
	February	94	29	30.9%		
	March	90	44	48.9%		
	April	119	39	32.8%		
	Total	**400**	**141**	**35.25%**		

*Significant, P < 0.05

A statistically significant association was observed in prevalence of paramphistomosis between breed and body condition score of the animals ($p < 0.05$), but there is no statistically significant difference in paramphistomosis in relation to age, month, and origins of the animals ($p > 0.05$) (Table 2). Prevalence of paramphistomosis was higher in local breed than cross breeds with the prevalence of 78 (22.8%) and 5 (8.6%) respectively.

Table 2. Prevalence of paramphistomosis with the breed, age, origin, and in relation to body condition

Risk factors	Category	No. of examined	No. of positive	Prevalence (%)	χ^2	P-value
Breed	Local	342	78	22.8%	6.069	0.014*
	Cross	58	5	8.6%		
Age	Adult	294	66	22.4%	1.947	0.163
	Young	106	17	16%		
Body condition score	Good	151	5	3.3%		
	Moderate	195	56	28.7%	48.576	0.000*
	Poor	54	22	40.7%		
Origin	Adama	102	19	18.6%		
	Bishoftu	138	28	20.3%	2.085	0.555
	Dukam	98	19	19.4%		
	Modjo	62	17	27.4%		
Month	January	97	19	19.6%	0.845	0.839
	February	94	19	20.2%		
	March	90	17	18.9%		
	April	119	28	23.5%		
	Total	**400**	**83**	**20.8%**		

*Significant, $P < 0.05$

Prevalence of *fasciola* species in infected liver

The liver was mostly infected with *F. hepatica* (51.1%) followed by *F. gigantica* (22%) and also infected with both and immature ones with the prevalence of (17%) and (9.9%) respectively (table 3).

Table 3. The distribution of *Fasciola* species in the infected liver in local (indigenous) breed of cattle slaughtered at Bishoftu municipal abattoir, Ethiopia from December 2021 to May 2022 (n= 141)

Species	No. of infected liver	Prevalence (%)
Fasciola hepatica	72	51.1%
Fasciola gigantica	31	22%
Mixed infection	24	17%
Immature *fasciola*	14	9.9%
Total	**141**	**100%**

Fluke Burden of Affected Livers

Fluke count made on 141 infected livers indicated that the overall mean fluke burden of affected livers is 41.3, the maximum and minimum number of fluke burden were 134 and 3 respectively. (Tables 4).

Table 4: The Overall mean fluke burden for *Fasciola* positive liver in local (indigenous) breed of cattle slaughtered at Bishoftu municipal abattoir, Ethiopia from December 2021 to May 2022**.**

Variable	Observed	Mean	Std. Dev.	Min.	Max.	95% CI*
Total fluke burden	141	41.3	35.79125	3	134	35.3-47.2

*CI: Confidence Interval

Analysis of the prevalence of fasciolosis during the four months that were considered in the current study showed statistically significant differences ($p < 0.05$). The highest infection rate was recorded in March (Figure 1).

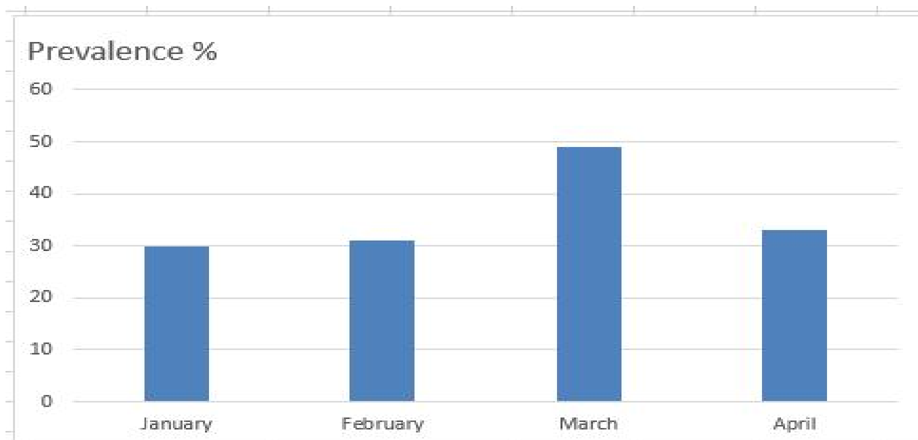

Figure 1. Prevalence of Fasciolosis by Month in local (indigenous) breed of cattle slaughtered at Bishoftu municipal abattoir, Ethiopia from December 2021 to May 2022

Discussion

From the total of 400 cattle that were brought to the Bishoftu municipal abattoir and slaughtered, the overall prevalence of fasciolosis was 35.25 %. This study's finding is aligned with the result of Fikirtemariam et al., 2013 who indicated 36.72% for the overall prevalence of fasciolosis in Bahir-Dar. Although, the result of this study on the overall prevalence of bovine fasciolosis is notably lower than the finding by (Yilma and Mesfin, 2000) who reported 90.65%, and the study by (Tadele and Worku, 2007) that reported 46.58%, and the study by (Dejene, 2008) that reported 50.98% at Gondar abattoir, Ethiopia, Jimma municipal abattoir, and Arsi, Ethiopia respectively. However, the results of this study on the prevalence of bovine fasciolosis were remarkably higher than the results of studies by Edilawit *et al*., (2012), Mulat *et al*., (2012), Fetene and Addis, (2014), and Birhan *et al*., (2019) at Wolaita Sodo abattoir, Gondar ELFORA abattoir, Dangila municipal abattoir, Debre tabor municipal abattoir who reported 25.33%, 29.75%, 30.21%, and 28.6% respectively on overall prevalence of bovine fasciolosis.

The overall prevalence of bovine paramphistomosis recorded in the current study is 20.8% and it is almost similar to other previous findings such as 23.8% reported by Juyal *et al.*,(2003) from India, 17.1% by (Phiri *et al*., 2006) from Zambia. In both case likely results may be cattle in study area graze in the same communal grazing land with similar agro ecological condition. So that the chance of acquiring the disease or becoming of infected is similar between early released of young stock with adult.

The Overall Prevalence of paramphistomosis observed in this study is lower than the result of Abebe *et al*., (2011) which was 57.52% in and around jimma; 40.1% by Melaku and Addis, (2012) at Deberzeitand 51.82% reported by Ayalew*et et al.*,(2016) at Gondar Elfora Abattoir and Mogdey *et al*., (2009) who reported 38.92% from Egypt. But the prevalence noted in the present study is greater than 5.43% reported by Hayidere *et al*., (2018) at Hirna municipal abattoir. These variations seen in prevalence between this and other similar studies elsewhere probably may be attributed to mainly to the differences in the geographical locations, climatic and ecological conditions such as altitude, rainfall, and temperature.

The prevalence of bovine fasciolosis noticed in the current study which is 36.8% and 25.9% in local and cross-breed animals respectively showed no statistically significant association between the occurrence of fasciolosis and specific breed which means, local and cross-breed animals are equally susceptible to fasciolosis. This finding is in agreement with that of Dilbato and Bekele *et al*., (2018) in Gurage Zone, Abeshege district. This might be because both breeds were gaining access to metacercariae during outdoor grazing.

The result of the current study showed that age had a significant effect on the prevalence of bovine fasciolosis in local (indigenous) breed with a prevalence of 30.3% and 49.1% in adult and young respectively. This study result was in agreement with (Yusuf *et al*., 2016) at Haramaya municipal abattoir with a prevalence of 16.3% and 73.5% in adult and young animals respectively; being higher in young animals than the adult. There was a decrease in infection rate as age increased. This may be because of increased acquired immunity with age which is manifested by a humoral immune response and tissue reaction in the bovine liver due to previous challenges. There are some additional reports confirming that the increased resistance against fasciolosis with age is most likely related to the high level of tissue reaction seen in bovine liver. Liver fibrosis which impedes the passage of immature flukes acquired thickening, stenosis and calcification of bile ducts, assumed unfavorable site for adult parasites and consequently fasten their expulsion. These are in agreement with experimental study conducted by (Radostits *et al*., 2007) which confirmed the occurrence of higher infection rate in younger animals. But difference prevalence between the two studies may be due to variation of the sample size. The current result study is in disagreement with the findings of Mariam *et al*., (2014) which showed that, age had no effect on the prevalence of fasciolosis.

The prevalence of paramphistomosison in relation with age indicated that there was no statistically significant difference in infection rate between adult and young age group animals. A relatively higher infection rate in older animals may be due to a long time of exposure. This may be due to the fact that, as the age of the animal increases, the possibility of longer exposure to paramphistomum will increase and hence, higher prevalence in older animals. This study finding is similar to that of (Pfukenyi *et al*., 2005) in Zimbabwe, (Eslami *et al*., 2011) in the north of Iran, (Yeneneh *et al*., 2012) in north-west of Ethiopia; Paramphistomum is no associations with the age of the animals. This is not in agreement with findings of (Keyyu *et al.*, 2006); who reported a significant difference in prevalence between the age groups.

The results of the present study indicated that body condition of the animal had significant association with the occurrence of fasciolosis and paramphistomosis with the prevalence of 72.2%, 37.4% and 19.2% for fasciolosis and 40.7%, 28.7% and 3.3% for paramphistomosis with poor, medium, and good body condition respectively. This finding is in agreement with the finding of

(Aragaw*et al.*, 2012) at Addis Ababa abattoir and (Turuna, 2019) at Nekemte municipal abattoir reported high prevalence of fasciolosis and paramphistomosis in poor body conditioned animals than medium and good body conditioned animals. The prevalence of fasciolosis and paramphistomosis was higher in the animals with poor body condition because this body condition in cattle is manifested when fasciolosis and paramphistomosis reaches at its chronic stage. However, this finding is not in agreement with the finding of Phiri *et al*., (2005) and Gojam and Tulu, (2018) who reported that the prevalence of bovine fasciolosis does not show a statistically significant association with the body condition of animals.

According to the findings of this study, origins of the cattle had significant effect on the prevalence of bovine fasciolosis, (P<0.05); being higher in Bishoftu (42%) than Adama (25.5%). The highest prevalence occurred at Bishoftu due to favorable environment for fasciolosis and intermediate host. But it is not significant effect on the prevalence of paramphistomosis. The difference of result may be due to the variation in sample and management system.

Out of the total liver infected (n=141), 51.1% were found to be positive for *F. hepatica*. Whereas *F. gigantica*, mixed and immature form of *fasciola* recorded was 22%, 17%, 9.9% respectively. The findings of the present study is in line with that of Turuna, (2019) who demonstrated that the predominant species of bovine fasciolosis in Nekemte Municipal Abattoir was *F. hepatica* (40.8%), followed by *F. gigantica* (22.4%), mixed and immature flukes (19.7%, 17.1%) respectively. The high prevalence of *F. hepatica* may be associated with the presence of favorable ecological biotypes for its snail vector *Lymnaea truncatula*. In support of the present study, (Berhe *et al*., 2009) reported that 56.42% of cattle were infected with *Fasciola hepatica*, 9.17% with *Fasciola gigantica* and 5.87% had mixed infection with both species of *Fasciola* at Mekelle, Ethiopia. In contrast to this study, (Abunna *et al*., 2010) stated that the most common liver fluke species affecting cattle at Wolaita Sodo was *Fasciola gigantica*. The higher prevalence of *F. gigantica* may be due to favorable condition to the existence and multiplication of snail *Lymnaea natalensis* in the study area. Malone et al (1998) indicated that *Fasciola gigantica* in Ethiopia is found at altitudes below 1800 meters above sea level. While *Fasciola hepatica* is found at altitude of 1200- 2560 meters above sea level. Mixed infections by both species can be encountered at 1200-1800 meters above sea level. According to Yilma and Malone (1998), such difference is attributed mainly to the variation in climatic and ecological conditions such as altitude, rainfall and temperature as well as livestock management system.

The mean fluke burden of the affected liver recorded in this study (41 flukes), is in agreement with that of Gojam and Tulu, (2018) reported 40 at Ambo abattoir. However, the finding in the current study is less than that of (Tadele and Worku, 2007), at Jimma abattoir who recorded 76 flukes. The mean fluke burden noted in the present study is higher than that of Amsalu et al., (2017) in and Around Haramaya Town who reported 28 flukes. The higher the fluke burden per affected liver reflects the more will be the pathogenic effect produced by the flukes on the host and the more effect it has on the production loss. Cawdery et al (1997) indicated that the infection with 54 flukes per animal resulted in (8%) reduction in weight gain. In line with this, the mean fluke burden recorded in the present survey is huge enough to cause considerable reduction in productivity of the animals.

Because of the fact that this study was conducted for only few months, it was not possible to appreciate the total seasonal prevalence and monthly variation of fasciolosis and paramphistomosis. However, highest infection rate of fasciolosis was encountered in March (48.9%) and lower in January (29.9%). Statistically significant monthly variation in infection rate of fasciolosis was observed (p > 0.05). This result disagrees with the finding of Beyene *et al*., (2017) in and around Haramaya Town, who did not find statistically significant difference on the basis of month. The monthly prevalence of paramphistomosis recorded in this study did not show statistically significant variation.

Conclusion

The current study has indicated that fasciolosis and paramphistomosis are still economically important health problems of cattle which cause condemnation of fluke infected livers in the study abattoir, Bishoftu Ethiopia. The prevalence of these parasitic diseases is a hindrance to the livestock productivity by causing remarkable direct or indirect losses in the study areas. Strategic treatment by anthelminthic drugs, avoiding animals from grazing in marshy areas, control of snails as intermediate host, awareness of breeders and stockholders about the economic loss, and importance of using protocol for prevention of fasciolosis and paramphistomosis at national level is highly suggested to control and prevention of these diseases.

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