African Journal of Basic & Applied Sciences 8 (1): 63-72, 2016
ISSN 2079-2034

DOI: 10.5829/idosi.ajbas.2016.8.1.23412

Comparison on Sensitivity of Coprological and Post Mortem Examination in Diagnosis of Bovine Fasciolosis: Prevalence of the Disease in Bedele Municipal Abattoir

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Abstract: A study was carried out to determine the prevalence and the species of liver flukes in indigenous cattle, to compare the diagnostic efficiency of fecal and post mortem examination (to evaluate the sensitivity of coprological test). The study was based on both post-mortem inspection of livers of slaughtered animals at Bedelle municipal abattoir and coprological examination using sedimentation technique on fecal samples collected from the same animals coming from Bedelle town and its neighboring districts. Thus, a total of 384 cattle were randomly selected and subjected to coprological and detailed postmortem examinations and the prevalence was found to be 8.33% (32/384) and 11.72% (45/384), respectively. The most common liver fluke species affecting the cattle was *Fasciola gigantica*, 37.78% of cattle were infected with *F. gigantica* while, *Fasciola hepatica*, mixed infections and unidentified or immature forms of *Fasciola* species were present in 17.78%, 35.56% and 8.89% of cattle, respectively. Taking liver examination as gold standard for diagnosis of fasciolosis, the sensitivity of the sedimentation technique was found to be 71.1% and the specificity 100% with very good agreement (kappa = 0.813) between the two methods. There was significant differences between coprological and postmortem examination ($P<0.05$). So, for effective control of fasciolosis other parasitological techniques with high sensitivity and specific should be developed.

Key words: Abattoir · Bedelle · Bovine · Coprology · Fasciolosis · Postmortem and Sensitivity

INTRODUCTION

Ethiopia has the largest livestock in venture in Africa including more than 53.99 millions (cattle), 25.5 millions (sheep), 24.06 millions (goat), 0.92 million (camel), 9.01 millions (Equine) and 50.38 millions (chickens) with livestock ownership currently contributing the livelihoods of an estimate 80% rural population [1]. But this huge livestock resource is not fully utilized because of various constraints of which poor animal production and management and livestock disease are the most important [2].

Fasciolosis is an important parasitic disease of domestic ruminants caused by two liver fluke species: *Fasciola hepatica* and *Fasciola gigantica*. *Fasciola hepatica* has a cosmopolitan distribution mainly in temperate zones while *Fasciola gigantica* found in tropical regions of Africa and Asia [3]. Bovine fasciolosis is an economically important parasitic disease of cattle in tropical and subtropical countries that limit productivity of animals [4]. In Ethiopia both *Fasciola hepatica* and *Fasciola gigantic* have the greatest risk occurred in areas of extended high annual rainfall associated with high soil moisture and surplus water, with risk diminishing in areas of shorter wet season and or lower temperatures. Arid areas were generally unsuitable (except where irrigation, water bodies or flood occur) due to soil moisture deficit and or, in the case of *Fasciola hepatica* high average annual mean temperature. For *Fasciola gigantica* regions in the high lands of Ethiopia and Kenya were identified as unsuitable due to in adequate thermal regime. Average annual mean

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temperatures of 23°Cor above were found to correspond to areas below the 1200 m elevation limit of *Fasciola hepatica* in Ethiopia [5].

The epidemiology of fasciolosis is dependent on the ecology of the snail intermediate host. Snails of the genus *Lymnaea* are the intermediate host for genus *Fasciola*. *Lymnaea truncatula* is the most common intermediate host for *Fasciola hepatica* in different parts of world [6] and in Ethiopia [7]. The most important intermediate host for *Fascoila gigantica* is *Lymnaea natalensis* and *Lymnaea auricularia* [4]. In general *Fasciola hepatica* is found at an altitude above 2000 meters and *Fasciola gigantica* at an altitude below 1200 meters and both species are found between 1200-2000 meters above sea level [8].

The ciliated miracidium actively seek and penetrate suitable intermediate host undergo several stages of development by asexual multiplication and the asexual development in the snail is also temperature related for both *Fasciola* species it takes two to several months [9, 10]. Infection of the final host occurs by ingestion of herbage contaminated with encysted metacercariea [9]. The development of infection in definitive host is divided in two phases: the parenchymal (migratory) phase and the biliary phase [11]. The parenchymal phase begins when encysted juvenile flukes penetrate the intestinal wall. After penetration of the intestine flukes migrate within the abdominal cavity and penetrate the liver or other organs [12]. The biliary phase coincides with parasite residence in the bile ducts and results from the heamatophagic activity of the adult flukes and from the damaged to the bile duct mucosa by their circular spines [4].

Diagnosis of fasciolosis both in animals and man may involve consideration of various aspects such as history, clinical findings and general epidemiology of disease. Confirmation in all cases can be made either by fecal examination or recovery of the worms at post mortem examination [13].

In acute cases of fasciolosis, sudden death, severe anemia, occurs due to the migrating young flukes through the liver; however no fluke's eggs are passed in the feaces. In sub-acute cases, signs of rapid loss of condition, anemia, high fluke egg count, death occurs 12-20 weeks after infection and in chronic fasciolosis gradual wasting severe anemia with ascites edema, bottle jaw and very high fluke egg counts may lead to death more than 20 weeks after infestation [14-16]. The most direct and reliable technique for diagnosis of fasciolosis is liver examination at slaughter or necropsy [17].

Various reports indicate that it is a serious problem of livestock production in Ethiopia causing considerable economic losses. Recently, small scale traditional irrigation scheme is expanding in many parts of the country. Hence it is anticipated that implementation of irrigated agriculture is creating favorable habitat for intermediate snail vector thereby influence the occurrence of fasciolosis [18]. Generally due to such and other serious problems research should be conducted to understand the epidemiology of the parasite in Ethiopia. But study of bovine fasciolosis not so far conducted in Bedele municipal abattoir. In the same way it was hypothesized from Bedele Woreda's development health agency that *Fasciola* is the cause of economic losses. The study was undertaken with the following objectives:-

- To compare diagnostic efficiency of coprological examination and post mortem examination.
- To determine the prevalence of bovine fasciolosis among cattle slaughtered at Bedelle Municipal Abattior.
- To evaluate the sensitivity of the direct coprological examination method.

MATERIALS AND METHODS

Description of Study Area: The study was conducted in southwestern Ethiopia, Illu Ababora zone, Bedelle district of Oromia state, Bedelle municipal abattoir that is 480 km from the capital Addis Ababa. Bedelle is located at an altitude of 1900-2000 m above sea level and 8-9°N latitude and 36-37°E longitudes. The area receive 1800-2050mm rain fall and the mean annual temperature varies from 20-25°c from October to January and decline to a level of 15-25°c during the rest of the months [19]. The livestock population of Bedelle district is 107,446 cattle (21,061 cows, 15,633 oxen, 10,810 bulls and 10,562 calves), 23,607 sheep and 24,192 goats, 8,134 equine and 48,400 poultry. The total area of Bedelle district is 74,600.01 km^2, from this 29,449.25 km^2 is used for cultivation; 1,960 km^2 for forest, 1440 km^2 for grassland and 41,750.76 km^2 is used for others [20].

Study Population: Only local breeds of cattle coming to Bedele municipal abattoir for slaughter with different age ranges (reached for slaughter) and all sexes. They were originated from Bedele and its neighboring districts (Chewaka, Chora, Dabo and Gechi).

Study Design: A cross-sectional study was conducted from November 2013 to March 2014 in Bedele municipal abattoir.

Sampling Method and Sample Size Determination: Simple random sampling was employed to generate data for the study at the abattoir on cattle presented for slaughter from Bedele and its neighboring districts. The number of cattle required for the study was determined by using the formula given by [21] for simple random sampling. By the rule of thumb where there is no information for an area it is possible to take 50% prevalence.

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

Where N=required sample size
P_{exp}=expected prevalence
d=desired absolute precision (usually 0.05)

The size of the sample is determined using 95% level of confidence 50% expected prevalence and 0.05 desire absolute precision.

$$\text{Therefore } N = \frac{1.96^2 (0.5) (1-0.5)}{(0.05)^2}$$

So the total animals sampled were =384 cattle were needed for the study

Coprological Examination: Faecal samples for parasitological examination was collected directly from the rectum of each selected animals at the time of ante mortem examination, thus ensuring that there is no contamination by litter and possibly by another animal feces. It was collected by two fingers-middle and point fingers protected by disposable plastic gloves. So fecal samples of at least 20 gram was placed in clean crew caped universal sampling bottle and clearly marked with identification number of the animals and brought to parasitology laboratory of Bedelle regional Veterinary laboratory for examination as soon as possible not more than 24 hours. When it obligatory to keep more than 24 hours, the feces was preserved in the 3% formalin solution to avoid eggs developing and hatching and enhance the sample to be examined for several days to months. The time of fecal sample collection was uniformly maintained at the time of ante mortem examination throughout the study period to avoid possible diurnal variation fluke egg output [22]. In the laboratory, coproscopic examination was performed to detect the presence of *Fasciola* eggs using the standard sedimentation technique [9]. To differentiate eggs of *Paramphistomum* species and *Fasciola* species, a drop of methylene blue solution was added to the sediment and eggs of *Fasciola* species show yellowish brown with and indistinct operculum and embryonic cells while eggs of *Paramphistomum* species is large and show, transparent egg shell with distinct operculum and embryonic clear cells [9].

During data collection detail records about the species, breeds, sex, origins, age, identification number and body condition of animal was recorded. Assessment of body condition was carried out using a modified method described by [23].

Post Mortem Examination: During meat inspection, liver of the previously identified Sampled during ante mortem, was followed during postmortem and examined its liver for presence or absence of *Fasciola*. Examination of livers for *Fasciola* was carried out immediately after removal of liver from abdominal cavity. In this study liver each selected animal slaughtered abattoir was collected and examined by visualization and palpation of entire organ that was followed by transverse incision of organ across the thin left lobe to confirm the case [24]. The collection flukes form each sampled animal was examined macroscopically and microscopically and classified as adult *Fasciola hepatica*, *Fasciola gigantic*, mixed and immature forms of liver flukes [4]. Flukes were collected in the universal bottle clearly marked with identification number of animals containing 10% formalin for preservation.

Data Management and Analysis: All data were coded and entered to Microsoft excel and a preliminary analysis was done in on it. The outcome variables were the cases of fasciolosis detected during routine postmortem inspection and fecal examinations for *Fasciola* eggs. Descriptive statistics were carried out to summarize the prevalence of each parasite. Univariate and multivariable logistic regression analysis were conducted to see the association between the risk factors and the occurrence of the infection. Confidence interval and p-value was used to notice the presence of association and Odds Ratios was employed to assess the strength and direction of this association using Stata statistical software [25].

RESULTS

Coprological Examination: In the present study, the coprological examination in 384 indigenous cattle slaughtered at Bedelle Municipal abattoir during the five months study period confirmed that, 32 animals (8.33%) were found to be infected with *Fasciola* eggs. The highest prevalence of fasciolosis was observed during November and March and the lower was seen during February and January. During coproscopy examination, the prevalence of fasciolosis was proved to be highest in poor body condition cattle when compared to cattle with good and medium body condition. This difference in the prevalence was not statistically significant (p>0.05). The prevalence of bovine fasciolosis between the five different woreda in the present study showed the presence of variability on the prevalence of bovine fasciolosis between them. The prevalence of fasciolosis was proved to be highest in Dabo and lowest Bedelle district. This difference in the prevalence was not statistically significant (p>0.05). During coproscopy examination, the prevalence of fasciolosis was proved to be higher in bovine above five years than five years and below five. This difference in the prevalence was not statistically significant (p>0.05) (Table 1).

The present study prevalence of bovine fasciolosis during coprological examination in December, January, February and March was 0.34, 0.54, 0.34 and 0.77 times of November respectively. The prevalence of fasciolosis in Bedelle, Chewaqa, Gechi and Dabo was 0.48, 0.94, 0.57 and 1.78 times of Chora respectively. The prevalence of fasciolosis in above five years was 1.73 times of five and below five. The prevalence of fasciolosis in medium and poor body condition was 1.37 and 2 times of good body condition respectively (Table 2).

Table 1: Association between prevalence and risk factors during coprological examination

Variable		No. of examined Cattle	Positive	Prevalence (%)	95% CI	p- value
Month	November	73	9	12.3	0.0662, 0.218	0.254
	December	78	4	5.13	0.0201, 0.1246	
	January	80	6	7.5	0.0348, 0.1541	
	February	80	4	5	0.0196, 0.1216	
	March	73	9	12.33	0.0662, 0.218	
BCS	Good	169	12	7.1	0.0411, 0.12	0.726
	Medium	206	19	9.22	0.0598, 0.1395	
	Poor	9	1	11.11	0.0199, 0.435	
Age	=5	37	2	5.41	0.015, 0.1771	0.498
	>5	347	30	8.65	0.0613, 0.1208	
Origin	Chora	56	6	10.71	0.05, 0.2146	0.081
	Bedelle	157	8	5.1	0.0261, 0.0974	
	Chewaqa	45	4	8.89	0.0351, 0.2073	
	Dabo	52	9	17.31	0.0315, 0.1087	
	Gechi	74	5	6.76	0.0292, 0.1487	
	Total	384	32	8.33		

BCS=Body condition score

Table 2: Multivariate logistic regression analysis of the association between risk factors by coprology

Variable		Odds Ratio	P-value	95%(CI)
Month	November	1/Ref*	-	-
	December	0.34	0.093	0.0959433, 1.197795
	January	0.54	0.286	0.1775529, 1.666486
	February	0.34	0.087	0.095725, 1.173101
	March	0.77	0.628	0.2702899, 2.201588
Origin	Chora	1/Ref*	-	-
	Bedelle	0.48	0.202	0.1517914, 1.488669
	Chewaqa	0.94	0.926	0.2381363, 3.686542
	Dabo	1.78	0.325	0.5690464, 5.473226
	Gechi	0.57	0.384	0.1626122, 2.010622
Age in year	= 5 year	1/Ref*	-	-
	> 5 Year	1.73	0.486	0.486. 3690499, 8.136063
BCS	Good	1/Ref*	-	-
	Medium	1.37	0.430	0.6247994, 3.015038
	Poor	2.00	0.541	0.2165082, 18.50281

Table 3: Prevalence of *Fasciola* species in cattle slaughtered from the total positives at Bedelle Municipal abattoir (n=384)

Fasciola species	No of infected liver	Prevalence (%)
Fasciola gigantica	17	37.78
Fasciola hepatica	8	17.78
Immature	4	8.89
Mixed	16	35.56
Total	45	100

Post-Mortem Examination and Species Identification: out of the 384 indigenous cattle slaughtered at Bedelle municipal abattoir and examined for fasciolosis, 11.72 % (n=45) were found to be positive for *Fasciola* species. Of the 45 livers found to contain fluke infection during post mortem inspection, 8 (17.78%) harboured *F. hepatica*, 17 (37.78%) *F. gigantica*, 16 (35.56%) had mixed infections and 4 (8.89%) contained unidentified immature fluke (Table 3).

Table 4 shows the results of liver examination on risk factors basis. From the total of 384 indigenous cattle slaughtered at Bedelle Municipal abattoir during the five months study period, 45 animals (11.72%) were found to be infected with *Fasciola* species. The highest prevalence was seen in November (19.18%) while the lowest in February (7.5%). The prevalence of bovine fasciolosis between the five different woreda in the present study showed the presence of variability on the prevalence of bovine fasciolosis between them. The highest (19.23%) and the lowest (8.89%) prevalence bovine fasciolosis were observed Dabo and Chewaqa, respectively. The prevalence of bovine fasciolosis between the three different body conditions in the present study showed the presence of variability on the prevalence of bovine fasciolosis between them. The higher prevalence (22.22%) was observed with cattle whose body conditions were thin and the lowest prevalence (10.66%) was recorded for cattle whose body conditions were good. During post-mortem examination, the prevalence of fasciolosis was proved to be higher in bovine above five years than five years and below five. The present study shows that there was no a statistical significant difference ($p>0.05$) in the prevalence of fasciolsis in cattle with different risk factors (Table 4).

The *Fasciola* species prevalence in cattle fom Bedelle district; 26.67%, 6.67%, 13.3% and 53.3% were *Fasciola gigantica*, *Fasciola hepatica,* immature and mixed, respectively. The *Fasciola* species prevalence in cattle fom Dabo district; 50%, 20%, 0% and 30% were *Fasciola gigantica*, *Fasciola hepatica,* immature and

Table 4: Association between prevalence and risk factors during post mortem examination

Variable		No. of examined cattle	Positive	Prevalence (%)	95%Confidence interval	p- value
Month	November	73	14	19.18	0.1090062, 0.3007886	0.221
	December	78	8	10.26	0.0453309, 0.1921275	
	January	80	8	10	0.0441709, 0.1875651	
	February	80	6	7.5	0.280205, 0.1561279	
	March	73	9	12.33	0.579549, 0.2211798	
BCS	Good	169	18	10.66	0.0684, 0.1621	0.554
	Medium	206	25	12.14	0.836, 0.1731	
	Poor	9	2	22.22	0.0632, 0.5474	
Age	=5	37	3	8.11	0.028, 0.213	0.473
	>5	347	42	12.1	0.0908, 0.1595	
Origin	Chora	56	8	14.29	0.0742, 0.2574	0.365
	Bedelle	157	15	9.55	0.0587, 0.1516	
	Chewaqa	45	4	8.89	0.0351, 0.2073	
	Dabo	52	10	19.23	0.108, 0.319	
	Gechi	74	8	10.81	0.558, 0.1991	

BCS=body condition score

Table 5: Prevalence of Bovine fasciolosis from different origins (PM-examination)

	Postmortem result				Species prevalence of positive (%)				
Origin	No. of examined cattle	Positive	Prevalence (%)	95% (CI)	FG	FH	IM	M	p-value
Chora	56	8	14.29	0.0742, 0.2574	25	25	25	25	0.365
Bedelle	157	15	9.55	0.0587, 0.1516	26.67	6.67	13.3	53.3	
Chewaqa	45	4	8.89	0.0351, 0.2073	50	0	0	50	
Dabo	52	10	19.23	0.108, 0.319	50	20	0	30	
Gechi	74	8	10.81	0.558, 0.1991	50	37.5	0	12.5	
Total	384	45	11.72		37.78	17.78	8.89	35.56	

mixed, respectively. The *Fasciola* species prevalence in cattle fom Chewaqa district; 50%, 0%, 0% and 50% were *Fasciola gigantica*, *Fasciola hepatica,* immature and mixed, respectively. The *Fasciola* species prevalence in cattle fom Gechi district; 50%, 37.5%, 0% and 12.5% were *Fasciola gigantica*, *Fasciola hepatica,* immature and mixed, respectively (Table 5).

Difference in Prevalence Between the Two Tests: Based on the comparison test there is significant ($X^2 = 262.982$, $P = 0.000$) difference (diff. = 3.39%) between fasciolosis prevalence estimated by coprological and post-mortem examinations. Hence, in this study, higher prevalence of infection was observed by post-mortem examination (11.72%) than by coprology (8.33%) as indicated (Table 6).

Sensitivity and Specificity of the Faecal Examination: One of the objectives of this study was to evaluate the sensitivity of the sedimentation technique of coprological examination method, which is routinely employed at field to examine the presence of *Fasciola* species eggs in faeces. The sensitivity and specificity of the method was computed by taking liver inspection at post mortem as gold standard for the diagnosis of fasciolosis. As indicated in (Table 7), there is no animal that was positive with fecal examination and negative during post mortem examination, which revealed that post-mortem examination was the golden test for diagnosis of fasciolosis when compared with coprology. Taking post-mortem examination as the gold standard technique for diagnosing *Fasciola* species infection, the sensitivity and the specificity of faecal examination was found to be 71.1% and 100%, respectively (Table 7).

Table 6: The difference in fasciolosis prevalence estimated based on Coprology and Postmortem at Bedelle Municipal abattoir during November 2013 to March 2014

Test type	No of positive	Prevalence	Diff	X^2	P -value
Coprology	32	8.33	3.39	262.982	0.000
PME	45	11.72			

*Diff = difference, PME = Postmortem examination

Table 7: Measuring the sensitivity, specificity and agreement level of the two tests

	Postmortem positive	Postmortem negative	Total	kappa
Coprology positive	32(a)	0(b)	32(a+b)	0.813
Coprology negative	13(c)	339(d)	352(c+d)	
Total	45(a+c)	339(b+d)	n = 384	

Sensitivity = a / a+c = (32/45)100% = 71.1%

Specificity = d / b+d = (339/339)100%=100%

Table 8: Multivariate logistic regression analysis of the association between risk factors in the abattoir (n = 384)

Variable		Odds Ratio	P-value	95%(CI)
Month	November	1/Ref*	-	-
	December	0.44	0.095	0.1687273, 1.153222
	January	0.46	0.109	0.1759243, 1.190611
	February	0.32	0.034	0.1149818, 0.917345
	March	0.51	0.168	0.1947652, 1.330564
Origin	Chora	1/Ref*	-	-
	Bedelle	0.61	0.307	0.235869, 1.576163
	Chewaqa	0.69	0.579	0.1884409, 2.542115
	Dabo	1.40	0.523	0.4976263, 3.944654
	Gechi	0.70	0.511	0.2420878, 2.027154
Age in year	= 5 year	1/Ref*	-	-
	> 5 Year	1.64	0.450	0.4535336, 5.952604
BCS	Good	1/Ref*	-	-
	Medium	1.171812	0.641	0.6022827, 2.279896
	Poor	2.38663	0.314	0.4390548, 12.97333

The present study prevalence of bovine fasciolosis during postmortem examination in December, January, February and March was 0.44, 0.46, 0.32 and 0.51 times of November respectively. The prevalence of fasciolosis in Bedelle, Chewaqa, Gechi and Dabo was 0.61, 0.69, 0.7 and 1.4 times of Chora respectively. The prevalence of fasciolosis in above five years was 1.64 times of five and below five. The prevalence of fasciolosis in medium and poor body condition was 1.172 and 2.87 times of good body condition respectively (Table 8).

DISCUSSION

Fascioliosis is an important parasitic disease of domestic ruminants caused by two liver fluke species: *Fasciola hepatica* and *F. gigantica* (Trematoda). *Fasciola hepatica* has a cosmopolitan distribution, mainly in temperate zones, while *F. gigantica* is found in tropical regions of Africa and Asia. Bovine fasciolsis exists in almost all region of Ethiopia. However, the prevalence, epidemiology and *Fasciola* species involved vary with locality. This is mainly attributed to the variation in the climate and ecological condition such as altitude, rainfall and temperature and livestock management system [7]. In the present study, 8.33% prevalence of fasciolosis was found based on faecal examination. This is much higher than the reports at Soddo abattoir 4.9% [26] and extremely lower than reports (80%) from Debre Berhan [27] which is one of the highland areas in Ethiopia. This may be due to agro-ecological difference which leads to the better survival of *Fasciola* and its vector, snail in some of the ecology while limiting in others. It may be also due to seasonal differences in which these different researches were conducted in different areas of the country. This study was conducted in a period known to be dry in Ethiopia however; the observed prevalence was considerable and reflects the existence of suitable ecological conditions in the study areas for snail breeding and development of larval stages within the snail intermediate host throughout the year regardless of the season. Due to this condition the prevalence of present study decreases from November to February and again to start increase. The abattoir (post mortem examination) prevalence of fasciolosis obtained from the present study (11.72%) is comparable with (14%) and (14.4%) o f bovine fasciolosis recorded at Soddo and Dire Dawa municipality abattoir by [26-28] respectively. However, it is much lower than several reports from different abattoirs in the country viz. 90.65% at Gondar abattoir [29], 86% at Keffa [30], 83.08% at South Gondar [31], 80% at Debre Berhan[27] and 46.58% at Jimma abattoir [32]. The variation in climato-ecological conditions such as altitude, rainfall, temperature, livestock management system and suitability of the environment for survival and distribution of the parasite as well as the intermediate host might have played their own role in such differences. One of the most important factors that influence the occurrence of fasciolosis in a certain area is availability of suitable snail habitat [4]. In addition, optimal base temperature to the levels of 10 ºC and 16ºC are necessary for snail vectors of Fasciola hepatica and Fasciola gigantica, respectively. These thermal requirements are also needed for the development of *Fasciola* with in the intermediate host. The ideal moisture conditions for snail breeding and development of larval stages within the snails are provided when rainfall exceeds transpiration and field saturation is attained. Such conditions are also essential for the development of fluke eggs, miracidiae searching for snails and dispersal of cercariae [4]. The absence of statistically significant difference in the prevalence of fasciolosis on monthly basis may be explained by the fact the study was conducted in the same season. The present study indicated that infection rate of fasciolosis was not significant ($P>0.05$) higher in age above five years than five years and below five years. The lower prevalence rate in five years and below five years might be due to the management system cattle in the study area they are not allowed to go far with above five years due to start fattening cattle at age of young in intensive system in study area.

Species identification revealed that *Fasciola gigantica* and mixed infection were more prevalent 37.78% and 35.56% respectively as compared to *Fasciola hepatica* (17.78%); and others unidentified immature fluke 8.89% (Table 3). The higher prevalence of *Fasciola gigantica* and mixed infection might be associated with the existence of favorable ecological biotopes for the intermediate host *Lymnaea natalensis* and *Lymnaea truncatula.* In support of the present study, [26] stated that the most common liver fluke species affecting cattle at Wolaita Sodo was *Fasciola gigantica* 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 [33-38].

The lower prevalence of fasciolosis reported using coproscopy (8.33%) than the abattoir result (11.72%) indicated the lower sensitivity of this technique in detecting fasciolosis. The detection of *Fasciola* eggs can be unreliable as the eggs are expelled intermittently, depending on the evacuation of the gall bladder [14]. In this study, the sensitivity of the fecal examination technique was found to be 71.1% in relation to the results of liver examination and a very good agreement (k = 0.813) was observed between the two tests. However, this test suggested that about 28.9% infected animals may pass undetected with single fecal examination technique. The present sensitivity value (71.1%) is comparable to the reports of 67.1% in Southern Ethiopia [34] and 69% in Switzerland [35]. However, it is much higher than the sensitivity reported by [26] at Welaita Sodo (35%). This might be attributed partly to the fact that *Fasciola* eggs only appear in feces 8-15 weeks post infection, so most of pathological lesions had already occurred [36, 37]. Furthermore, detection of *Fasciola* eggs can be unreliable even during the patent period because the eggs are expelled intermittently, depending on the evacuation of the gall bladder [38].

CONCLUSION

Fasciolosis is an important parasitic disease of domestic ruminants caused by two liver fluke species: *Fasciola hepatica* and *F. gigantica.* In the present study low infection rate was documented with both post mortem and coprological examination of bovine fasciolosis in Bedelle and its neighboring districts. The prevalence in this study was very low in compared to other researcher's reports throughout the country. This lower infection rate may be due to the study was conducted during dry season which may influence the snail and *Fasciola* burden in the area. As it is well known, suitable ecological factors are necessary for both the development of the parasite and the intermediate host, snail. These suitable snail habitats such as clear water or mud and or temporary man-made depressions filled with water may dry during the study season and contribute to this low result. Even though, the prevalence is low, still there is high economic loss incurred by these few level parasitic infection which demands strict control measures on the snail and parasites. Furthermore, Fasciolosis has a public concern; this further needs the control of fasciolosis, even if it is in low prevalence in the area. Finally, the sensitivity of coprological examination was lower in compared to post mortem examination. Therefore based on the current findings the following points were recommended:

- For effective control of fasciolosis other parasitological techniques with high sensitivity and specific should be developed
- Further study which includes all seasons of the year should be conducted to find the actual level of infection in the area.

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