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Thesis on Prevalence of Bovine *Fasciolosis* and Around Dimtu Town, Jimma Zone, Ethiopia

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Abstract

A cross-sectional study was conducted from September 2017 to December 2017 in and around Dimtu town, southwestern Ethiopia, to determine the prevalence of bovine *Fasciolosis* and its associated risk factors. Systematic methods were used to select the study animals and sedimentation technique was applied for recovery of Fasciola eggs from fresh fecal samples. Out of 384 fecal samples examined,101were positive and overall prevalence of *Fasciolosis* was 26.3% in the study area. The prevalence of bovine *Fasciolosis* was similar in Gibe grazing site 25(25.8%) as compared to Lanjibo grazing site 52 (25.1%), Harsu grazing site 17(37%) and Waro grazing site 7(20.5%). However, there was no statistically significant difference on the prevalence of bovine *Fasciolosis* based on grazing site. Similarly, not statistically significant difference observed between body condition ($p>0.05$). However statistical significant differences were appreciated among the age and sex of animal categories ($p<0.05$). Adult 95 (34%),Young 3(3.4%)and old 3(15.8%) prevalence. The prevalence relation in was 13 (15.7%) in male group 88 (29.2%) in female animal. Therefore, *Fasciolosis* should be taken in to consideration as one of the major limiting factor to livestock productivity in and around Dimtu town. Hence, control measures against *Fasciolosis* must be designed to target either the parasite or the snail intermediate host or by regular deworming or drainage the area.

Keywords: Ovine • Body condition • Prevalence • *Fasciolosis*

Introduction

Background

Fascioliasis is among the important parasitic diseases in tropical and subtropical countries which limit productivity of ruminants particularly in cattle. *Fascioliasis* is zoonotic *Trematodes* of great public health importance affecting ruminant animals and man. The class *Trematodes* falls into two main subclasses, the *Monogenea*, which have a direct life cycle, and the *Digenea*, which require an intermediate host. The former are found mainly as external parasite of fish. While the latter are Sound exclusively in vertebrates and are of considerable veterinary importance. The adult digenetic *Trematodes*, commonly called 'flukes', occur primarily in the bile ducts, alimentary tract and vascular system. Most flukes are flattened dorsoventrallv. Have a blind alimentary tract. Suckers 2, for attachment and are hermaphrodite. The egg pass out of the final host usually in faeces and the larval stage develop in a *molluscan* intermediate host. For a few species, a second intermediate host is involved, but the mollusc is essential for all members of the group [1].

Fascioliasis is among the important parasitic diseases in tropical and subtropical countries which limit productivity of ruminants in particular cattle. The development of *Fasciolosis* involves the presence of an intermediate host (*Lymnaea* sp.), suitable habitats for *mollusks* and environmental factors such as high humidity, adequate temperature and rainfall. Furthermore, when infecting the definitive host, mature flukes lay eggs that spread in the environment and cause pasture recontamination [2].

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Fasciola is commonly recognized as liver flukes and they are responsible for wide spread of morbidity and mortality in cattle characterized by weight loss, anemia and hypoproteinemia, reduced production of meat, milk, and wool, and expenditures for anthelmintic. The total global economic loss attributed to *Fasciolosis* has been estimated earlier to be more than US$3 billion per year.

Fasciolosis is one of the economically important diseases of domestic livestock particularly in cattle and sheep, and occasionally human beings. Highlighted the significance of *Fasciolosis* as an emerging helminthes zoonotic and reported that currently there are 2.4 to 17 million human cases globally and 91.1 million people are living at risk of infection. The two species most commonly implicated as the etiological agents of *Fasciolosis* are *Fasciola* hepatica and *Fasciola gigantica*. *Fascioliasis* is a zoonotic disease of public health importance. Man becomes infected when metacercariae of the fluke is ingested along with water Cress Salad and vegetables grown along banks of water reservoirs inhabited by potential snail hosts [3].

Statement of problem

One of the most important parasitic diseases in adult cattle is *fascioliasis*, caused mainly by *Fasciola gigantica* and hepatica. The economic loss from *fascioliasis* in cattleis high. *Fascioliasis* is a disease that affects the liver parenchyma and bile ducts of numerous animals, including humans, which causes economic losses and threatens public health. In sheep and sometimes cattle, the damaged liver tissue may become infected by the Clostridium bacteria. The bacteria will release toxins into the bloodstream resulting in what is known as black disease. There is death follows quickly. Black disease is found wherever populations of liver flukes and sheep overlap. The economic losses due to *fascioliasis* are caused by mortality, morbidity, and reduced growth rate, condemnation of liver, increased susceptibility to secondary infections and the expense of control measures [4].

Objective

General objective:

- The main goal of the present study was be to provide detail information of cattle *Fasciolosis* in and around Dimtu town (study area).

Specific objective:

- To determine the prevalence of bovine *Fasciolosis* in and around Dimtu town and

- To identify host and ecology related risk factors

Significance of the study

The aim of the study is to determine the prevalence of *Fasciolosis* in cattle and identifying the potential risk factors associated with the disease in Dimtu veterinary clinic to overcome the problem accordingly by following this study. Among of them are announcing the area as there is exposure of *Fasciolosis*, to apply all control method of parasite in the area, and treating all infected animal in the area.

Etiology

Fascioliasis is caused by Fasciola hepatica and less often by *Fasciola gigantica*, which are flat worms classified as liver flukes (*Trematodes*). Some human cases have been caused by hybrid species. Additional *Fasciola* species have been found in animals.

Life cycle

The life cycle involves a snail host whose activity and availability require adequate moisture and a suitable ambient temperature during the summer months. Recent wet summers have been ideal for this complicated fluke lifecycle by supporting large numbers of snails in wet habitats. Cerceriae are released from snails between August and October which develop into the infective metacercariae, which can survive on pasture for several months to infect grazing cattle. Disease is then seen in cattle from mid-winter onwards After ingestion by the host, the metacercariae develop within the small intestine and penetrate into the peritoneal cavity, going on to invade the liver capsule reaching the bile duct after six to eight weeks. Egg-laying adults will have developed 10-12 weeks after ingestion. Infected cattle produce an intense fibrous reaction within the liver, with the resultant fibrosis much more severe than that observed in sheep (Figure 1).

Transmission

Fasciola infection is determined by the presence of the intermediate snail hosts, domestic herbivorous animals and climatic conditions. Sheep, goats and cattle are considered the predominant animal reservoirs. The above life cycle is mostly expressing the transmission Fasciola [5].

Pathogenesis

Eight to ten weeks after cattle ingest metacercariae, adult flukes will be present in the bile ducts of the liver. Individual adult flukes will attach at various sites to the walls of the bile duct and feed on blood. The multi-site feeding pattern in combination with the irritation from the spines on the fluke's cuticle irritate the bile ducts, which cause thickening of the bile duct walls and impairment of liver function. Chronic irritation can actually lead to calcification of the bile duct walls. The presence of a single fluke can lead to pathology of the liver and condemnation. If sufficient numbers of flukes are present, they can cause a primary anemia from their blood feeding. Proline, an amino acid produced in large amounts by adult flukes, also intensifies the thickening of the bile duct walls, and there is evidence that Proline may also directly cause anemia by destroying red blood cells [6].

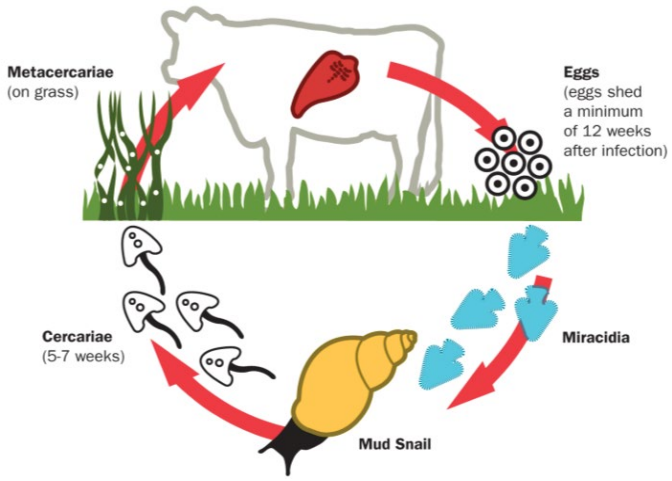

Figure 1. Life cycle of bovine *Fasciolosis* (philscot).

Epidemiology

Several factors are necessary for infection with liver fluke (*fascioliasis*) to occur. Seasonally, these factors can all be present in most areas of the United States, with very few areas exempt. The simple representations of conditions needed for liver fluke infections to develop are: Fluke-Infected Animal, *Lymnaea* Snail, and Environmental Conditions

Fluke-Infected Animal. Presence of an infected animal in the area is necessary. It should be noted that the liver fluke is capable of infecting and reproducing in life cycle.

Several animal species other than cattle. Fasciola hepatica has also been found to occur in the bile ducts of sheep, goat, and other ruminants; hare; rabbit; beaver; dog; cat and man. This broad potential host base, plus the increase in mobility of the livestock population, makes most grazing areas of the United States potentially infected.

Lymnaea Snail

Numerous *Lymnaea* snail species which are distributed across the United States and worldwide can act as the intermediate host of Fasciola hepatica. The snails are amphibious, easily capable of surviving out of water when the relative humidity is high. They are capable of withstanding summer drought or winter freezing for several months by aestivating, which means hibernating deep in the mud. Permanent habitats include banks of ditches and streams, and the edges of ponds. Following periods of rainfall, temporary habitats can include hoof-prints and tire ruts. *Lymnaea* snails are hermaphroditic and very prolific. In a three-month period a single snail is capable of producing up to 100,000 descendants [7].

Proper environmental conditions

Several environmental conditions are necessary for propagation and development of both the *Lymnaea* snail and the developing larval forms of the fluke. Moisture is necessary for the amphibious snail, and also for the swimming Cerceriae. The ideal temperature range for optimal development of both snail and fluke larvae is 84.6-93.6 ºF (15-20°C). Development can occur at temperatures between 75.6-84.6ºF (10-15ºC) but it will be slightly slower in a cooler environment. The snails also prefer a slightly acid ph. During certain times of the year, almost all pasture land in the United States falls into these parameters. *Fasciolosis* is one of the most prevalent helminthes infections of ruminants in different parts of the world including Ethiopia. It causes significant morbidity and mortality.

Clinical sign and diagnosis

Liver fluke clinical signs Chronic Loss of condition, Lethargy, Anemia, Bottle jaw, Sub-optimal growth rates, Diarrhea, Metabolic disease in dairy cows, Reduced milk yield in dairy cows, Reduced fertility, Signs are exacerbated by poor nutrition or gastro-intestinal parasitism. And diagnosis of *Fasciolosis* is based primarily on clinical signs, seasonal occurrence, prevailing weather patterns, and a previous history of *Fasciolosis* on the farm or the identification of snail habitats. While diagnosis of ovine *Fasciolosis* should present few problems, especially when a postmortem examination is possible, diagnosis of bovine *Fasciolosis* can sometimes prove difficult. In this context, routine hematological tests and examination of faeces for fluke eggs are useful and may be supplemented by two other laboratory tests. The first is the estimation of plasma levels of enzymes released by damaged liver cells. Two enzymes arc usually measured. Glutamate dehydrogenase (GLDH) is released when parenchymal cells are dam- aged and levels become elevated within the first few weeks of infection. The other, gamma glutaniyl trans peptidase (GGT) indicates damage to the epithelial cells lining the bile ducts; elevation of this enzyme takes place mainly after the flukes reach the bile ducts and raised levels are maintained for a longer period [8].

Treatment and control

Triclabendazoleis effective at killing all stages of Triclabendazole-susceptible flukes from two weeks old. Cattle may be slaughtered for human consumption only after 56 days from last treatment. Do not administer to cows producing milk for human consumption. Intensive use or misuse of preparations such as Triclabendazole can give rise to drug resistance with reduced efficacy of the preparation. Nitroxynil is licensed for the treatment of *fascioliasis* (infestation of mature and immature Fasciola hepatica more than 8 weeks after infection). The interval between nitroxynil treatments must not be less than 60 days. Cattle may be slaughtered for human consumption only after 60 days from last treatment. Do not use in cattle producing milk for human consumption. Clorsulon is only effective against adult flukes. Cattle may be slaughtered for human consumption only after 60 days from last treatment. Do not administer to cows producing milk for human consumption nor dairy cattle including heifers within 60 days of calving. The recovery of chronically infected cattle is slow following treatment with a flukicide. Improved nutrition of affected cattle is essential to restore body condition and production. Treated cattle should be moved to clean pastures wherever possible [9].

Importance

Economic importance: The economic losses due to *Fasciolosis* are caused by mortality, morbidity, and reduced growth rate, condemnation of liver, increased susceptibility to secondary infections and the expense of control measures. The direct economic impact of *Fasciolosis* infection is increased condemnation of liver meat, but the far more damaging effects are decreased animal productivity, lower calf birth weight, and reduced growth in effected animals. Economic impact of *Fasciolosis* on livestock is enormous. Great loses are evident especially where farmers have little or no knowledge on the disease. Loses are more encountered during raining season when most stocks are exposed to fluke challenge. Reduction in milk and meat production, condemnation of liver, loss of draught power, reproduction failure and mortality are some of the losses encountered [10].

Public health importance: Humans are infected by eating water grown plants, primarily wild-grown watercress in Europe or morning glory in Asia. Infection may also occur by drinking contaminated water with floating young Fasciola or when using utensils washed with contaminated water. Cultivated plants do not spread the disease in the same capacity. Human infection is rare, even if the infection rate is high among animals. Especially high rates of human infection have been found in Bolivia, Peru and Egypt, and this may be due to consumption of certain foods. No vaccine is available to protect people against Fasciola infection. Preventative measures are primarily treating and immunization of the livestock, which are required to host the live cycle of the worms [2]. Veterinary vaccines are in development, and their use is being considered by a number of countries on account of the risk to human health and economic losses resulting from livestock infection. Other methods include using molluscicides to decrease the number of snails that act as vectors, but it is not practical. An educational method to decrease consumption of wild watercress and other water plants has been shown to work in areas with a high disease burden [6]

Materials and Methods

Study area

Tiro Afeta is found in the eastern central part of Jimma Zone, at 64 Km from Jimma town in Oromia Regional state at 316 km south west of Addis Ababa at longitude of 35°52'-37°37'E and latitude of 7°36'-8°56'N. It has an area of 1001.9 km^2 and four urban centers, i.e., Akko, Raga-Siba, Gebbera and Dimtu town (district's capital) and 26 Kebeles. It has common boundaries with BotorTole, Sekoru, LimuKossa, Kersa, Omo Nada districts and Southern Ethiopian people's Regional State. Attitudinally, the district lies between 1640 and 2800 metres above sea level. The district is classified into woinadega (85%) and dega (15%) agro climatic zones. The average minimum and maximum annual temperatures were 70C and 300C, respectively. Agriculture is the livelihood for more than 90% of the population in rural farming community. The main agricultural system in the area is mixed crop livestock production and animals are mainly reared in an extensive system. Tiro Afeta a livestock population of 414,297 (188,835 cattle; 56,338 sheep; 37,053 goats; 8,829 donkeys; 7,243 horses; 4,581 mules and 111,418 poultry) [11]. Tiro Afeta has 39,379 cows. Tiro Afeta had about 100,700 populations, of which 99,221 were rural (50,431 females) and 1,458 were urban (756 females) populations (projected from the 1994 Population and Housing Census result). Young, economically working (household) and old age populations accounted for 46.6%, 50.4% (50,753) and 3.0% respectively. Average family sizes for rural and urban areas were 4.6 and 3.9 persons respectively. The district's crude population density is estimated at 100 persons per km^2. This study will be conducted in and around Dimtu town (Figure 2).

Study animal

The sampling units of the study will be cattle of different breed, age, sex and that will be found around Dimtu town. The study animals will be sampled from different sites of the study area. The breed of cattle will be categorized as local and cross (local vs Holstein Friesian) breeds. The age of each animal will be estimated using the dentition pattern. The cattle would have different body condition scores like, good, medium and poor body condition score and they will be kept in three different management systems (extensive, semi intensive and intensive management systems).

Study design and examination method

A cross sectional study will be conducted on local and cross breed cattle to estimate the prevalence of bovine *Fasciolosis* and its possible risk factors in and around Dimtu town. This study will be performed by coprological examination of samples which will be collected from randomly selected animals. Samples of fresh faeces will be collected directly from the rectum of the cattle. Then the collected samples will be preserved by 10% formalin in a universal bottle with proper labeling of every necessary information and then transported to laboratory. Then, the samples will be examined by using sedimentation technique [12].

Sample size determination and sampling method

The sample size will be determined by using the formula given by Thrusfield (2005), with 95% confidence level, 5% desired absolute precision and this study is not conducted before in this area so there is no expected prevalence. According to Thrusfield (2005), the number of samples this particular study was calculated as follows:

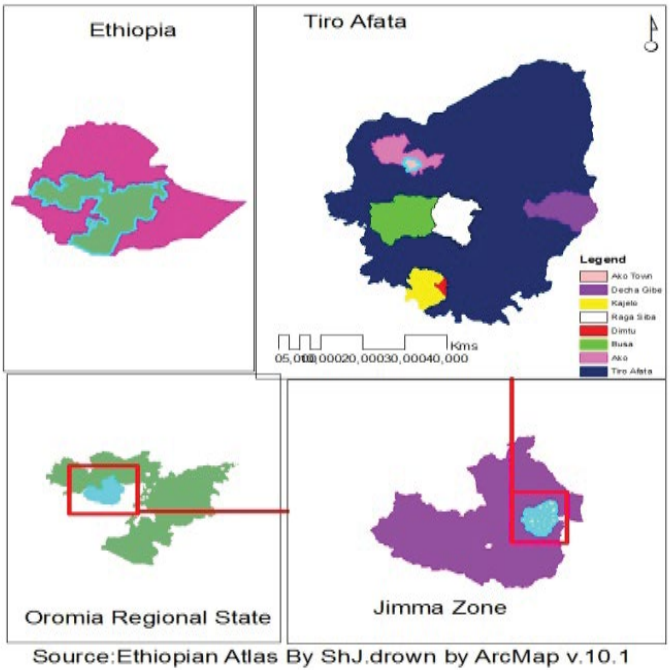

Figure 2. Map of study area.

Table 1. Prevalence of bovine *Fasciolosis* based on risk factors.

	Risk Factor	Number of Examined	Number of Positive (%)	X^2(p-value)
Age	Young	86	3 (3.4%)	32.815(0.000)
	Adult	279	95 (34%)	
	old	19	3(15.8%)	
	Total	384	101 (26. 3 %)	
Body condition	Poor	26	7 (26.9%)	1.008(0.616)
	Medium	258	64 (24.8%)	
	Good	100	30 (30%)	
	Total	384	101 (26.3%)	
Sex	Male	83	13(15.7%)	6.184(0.016)
	Female	301	88 (29.2%)	
	Total	384	101 (26.3%)	
Grazing site	Harsu	46	17(37%)	3.4(0.331)
	Waro	34	7 (20.5%)	
	Lanjibo	207	52(25.1%)	
	Gibe	97	25(25.8%)	
	Total	384	10 1(16.8%)	

$n=(1.96)^2 pexp (1-pexp)$

d^2

Where: n=required sample size

Pexp=expected prevalence

d=desired absolute precision

Therefore, the number of cattle, examined in this study will be calculated to be 384. Simple random sampling method will be applied to select study animals. During sampling of the animals, their breeds, age groups, sex, body condition score and management system will be recorded.

Fecal sample and data collection

Fecal sample will be collected per rectum of individual animals using gloved fingers and put into sampling bottles containing 10% formalin and label each sample. During every sampling of study animals' information on sex, breed, approximate age of individual animals, body condition scores, study Keble and altitude, grazing type or grazing situation, vegetation cover (ecology) and water source for animals will be recorded on data recording sheet. Then after collection, samples are transported to laboratory for analysis. Sedimentation technique will be employed to assess the presence of *Fasciolosis* eggs through repeating dilution of the fecal suspension and sedimentation of the eggs, which are heavier than most of the fecal particles.

Data management and analysis

The collected data was entered and stored into Microsoft Excel spreadsheet 2007. The data were thoroughly screened for errors and properly coded before subjecting to statistical analysis. The data were imported from the Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 20. Descriptive statistics was used to determine the prevalence of *Fasciolosis* and Chi-square (x^2) test was used to assess the association of the potential risk factors like age, sex, body condition, and Peasant association (PA)for the occurrence of the *Fasciolosis*. A 5% significance level was used to determine whether there are significant differences or not.

Data Presentation and Analysis and Interpretations

Among 384 cattle examined usingcoproscopical examination in the field survey 26.3% (n=101) were found to be positive for bovine *Fasciolosis* (Table 1)

The prevalence of bovine *Fasciolosis* at Harsu grazing site 17(37%), at Waro grazing site 7(20.7%), at Lanjibo grazing site 52 (25.1%) and gibe grazing site 25(25.8%). However, there was no statistically significant difference on the prevalence of bovine *Fasciolosis* based on grazing site. Similarly, there was not statistically significant difference observed between three body condition scoring ($p>0.05$). There was statistically significant differences appreciated among the sex and age categories ($p<0.05$). Male cattle 13 (15.7%) and female 88 (29.2%) and young cattle 3 (3.4%), adult 95 (34%) and old cattle's were 3(15.8%) hadprevalence respectively.

The present study revealed an overall prevalence of 26.3% in the study peasant associations and Agro-ecological zone. The results indicated that both ages and both sexes were at about difference risk to acquire the infection that adult cattle's are more exposure to the *Fasciolosis* than both young and old cattle this is due to long distance movement of adult cattle this is because of exposure to the risk factors, as there were no restriction on movement for grazing and contact with the parasite in terms of adult age. In case of sex, female cattle are more prevalent than male this is because of the female cattle are move everywhere for grazing while males are reared in selected area for their grazing after ploughing so the male are limited for the movement for searching food. The cattle were seen grazing in the area that necessitates more contact times with the larval stage of the parasite and the snail intermediate vector. This creates ideal condition for the multiplication of *Fasciolosis* and increases the epidemiology of the disease [13].

Conclusion and Recommendations

Bovine *Fasciolosis* is one of the endemic diseases in Africa that deserve serious attention. Even though there has been little recognition of its medicalsignificance, Ovine *Fasciolosis* does cause significant loss throughout the world. This is due to the nature of the disease, which usually occurs at sub clinical level with long-term effect on animal growth and productivity and increase susceptibility to other parasitic or bacterial infection.

The prevalence of ovine *Fasciolosis* recorded in this study based on coprologicalexamination revealed the presence of *Fasciolosis*in the sheep population of the in and around Dimtu town. The disease was detected in both sexes and age groups of the study animals. In addition, the occurrence of the diseases is closely linked to the presence of biotypes suitable for the development and multiplication of intermediate hosts. Therefore, this study revealed that bovine *Fasciolosis*was one of the major parasitic diseases contributing to loss in productivity and production of cattle in the study area. Depend up on this conclusion the following recommendations are forwarded.

- *Fasciolosis* should be considered as one of the major limiting factor to livestock productivity in and around Dimtu town.
- Implementation of appropriate control measures for the intermediate host should be encouraged.
- Strategic use of anti-helminthesshould be practiced to reduce pasture contamination with fluke eggs.
- Detailed studies involving additional risk factors should be conducted on this similar study.

References

1. Meleney, Willian P. and Ke Chung Kim. "A comparative study of cattle-infesting Haematopinus, with redescription of H. quadripertusus Fahrenholz, 1916 (Anoplura: Haematopinidae)." *J Parasitol* (1974): 507-522.
2. CDC - Fasciola Prevention & Control". Www.cdc.gov. Retrieved 2015-07-17
3. Center of disease control (CDC). 2017.
4. Chen, M. G. and K. E. Mott. "Progress in assessment of morbidity due to *Fasciola hepatica* infection: A review of recent literature." *Trop Dis Bull* 87 (1990).
5. Kalu, Ekenma. "Bovine fascioliasis: A review." *J Agric Vet Sci* 8 (2015): 23-26.
6. Jassim, Adwa Fezaa, Yaseen Majid Salman AL-Adilee and Aseel Ahmed Mustafa.

"Role of rosmarinus officinalis phenolic compounds in treatment of entamoeba histolytica infection."

7. Isseroff, Hadar, Robert N. Spengler and David R. Charnock. "Fascioliasis: similarities of the anemia in rats to that produced by infused proline." *J Parasitol Res* (1979): 709-714.
8. Karim, Md Rezaul, Mohammad Showkat Mahmud and Md Giasuddin. "Epidemiological study of bovine fasciolosis: prevalence and risk factor assessment at Shahjadpur Upazila of Bangladesh." *Immunol Infect Dis* 3 (2015): 25-29.
9. Okewole, E. A., G. A. T. Ogundipe, J. O. Adejinmi and A. O. Olaniyan. "Clinical evaluation of three chemoprophylactic regimes against ovine helminthosis in a Fasciola-endemic farm in Ibadan, Nigeria." *Isr J Vet Med* 56 (2001): 17-24.
10. Pal, M. "Zoonoses." (2007): 179-180.
11. Pal, Mahendra, Mukarim Abdurahman and Mesfin Zewdu. "Growing significance of fascioliasis as an emerging zoonosis." *Ethiopian int j multidiscip res* (2014): 10-13.
12. Rahman, M. M., A. Kabir, S. Ahmed, M. Islam and M. Alam. "Progress of WHO-essential flukicide triclabendazole and its remarkable impact in combating fascioliasis in human and animal herbivores." *Bangladesh j vet Anim Sci* 5 (2017): 1-10.
13. WHO (1995). Control of food-borne trematodesinfections. Technical Report Series No. 849. World Health Organization, Geneva, Switzerland.

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