Original Research Article

Coprological, abattoir survey and economic significance of bovine fascioliasis at Sylhet region of Bangladesh

ABSTRACT

This study was conducted in the Sylhet division of Bangladesh with the aim of determining the prevalence of fascioliasis in cattle of different age groups, sex and in seasons as well as to assess risk factors and economic loss caused by this parasite. In this study, faeces and livers of male and female animals were collected randomly from different farms and slaughterhouse respectively during a period of one year (September 2016 to August 2017). Coprological examinations were performed by standard sedimentation technique and liver samples were examined by slicing the collected livers. A total of 613 faeces and 215 livers were examined of which 119 (19.41%) and 52(24.18%) were found to contain *Fasciola gigantica* respectively. Fasciola in feces and liver samples were observed significantly (P=0.002 and 0.018) higher in older animals of above 5 years estimating 25.64% and 36.36%, respectively. The lowest prevalence of feces samples was found in cattle of >3years of age (10.27%) and the animals aged between 3-5years (20.00%) in case of the liver sample. The prevalence was higher in females contributing 19.42% in feces and 26.66% liver samples. Among three seasons, the infection was found to be more during rainy season 23.66% and 33.03% in faeces and liver sample respectively. The present study indicates that fasciola infection in cattle associated with the age and sex of the animals; and seasons of the year. To control the disease in this area, appropriate preventive control strategies have to be designed to reduce the impact of the disease on livestock production in Bangladesh.

Keywords: Fascioliasis, Prevalence, Feces, Abattoir survey, Cattle.

1. INTRODUCTION

Fascioliasis is globally known to be an important helminthic disease of ruminants caused by the genus fasciola and it is one of the most neglected tropical zoonotic diseases. Among the parasitic diseases, fascioliasis is most important in Bangladesh. *F. gigantica* is the most important liver fluke in the tropics and temperate regions frequently reported of causing ruminant's fascioliasis [1]. Usually, animals become infected by the ingestion of infected or contaminated feed, water and pasture [1,4]. Infection to host animals usually takes place with fasciola metacercariae by ingesting contaminated vegetation near to or within wet grazing land [4]. The clinical signs of this disease in cattle, sheep and goat are characterized by weight loss, anemia and development of bottle jaw due to hypoproteinemia; reduce production, poor performance, condemnation of liver and increased mortality [5]. Others [6] expressed that the total economic losses because of fascioliasis as far as liver condemnations and carcasses weight losses over the 3 years of the study were evaluated 16,800.4 USD. The economic losses consist of costs of anthelmintic, drenches, labour, and liver condemnation at meat inspection: and losses in production due to mortality, reduction in meat, milk and wool production: and reduction in growth rate, fertility and draught power [7]. In Bangladesh, until now there is no available report about the economic losses due to fascioliasis in cattle. The estimated economic losses due to condemnation of the liver were 5.59% which amounted to US$ 115.44 per thousand liver of slaughtered goat [8]. The direct economic impact of fascioliasis is increased condemnation of liver meat; the far more harmful effects are reduced animal productivity, under-weight calf birth and mitigate the growth in infected animals [9]. Berando*et al.* [10] also reported that the parasite may cause the decline of production in milking cows. Earlier reports suggest around 19-53% prevalence of fascioliasis in cattle in various districts of Bangladesh [11-13]. The prevalence of fasciola infection depends on several risk factors related to the biology of the host and parasite, as well as the management

of flocks and herds. It also relates with the availability of intermediate host snail (*Lymnea auricularia*), temperature, moisture, seasons, the health status of animal, improper sanitation, and availability of flooded area or irrigated land which is used as a grazing field for animals [14]. Coprological examination is a usual tool to investigate prevalence or diagnosis of fascioliasis. Fascioliasis has raised emerged and reported zoonosis in many countries with an estimation of 17 million infected people and up to 180 million at risk [2]. There was an Outbreak of Human *Fascioliasis* in Southwest China [26] where 29 hospitalized patients from 18 families were discovered according to the definition for fascioliasis. It can be transmitted from animal to human by consumption of infected improperly cooked liver. Considering the economic importance and pathological effects of liver fluke infection in cattle in Sylhet region, this study was conducted to determine the prevalence, risk factor assessment and economic analysis of fascioliasis in cattle relation to age, sex, and seasons based on fecal and abattoir survey.

2. MATERIALS AND METHODS

2.1 Study Area and Period

The research was carried out in cattle of Sylhet region in Bangladesh. The area under lies in the Sylhet division is located in the north-east part of Bangladesh and between 24°32′ North latitude and 91°52′ East longitudes. The average maximum and minimum temperatures are 38°C and 7°C, respectively. The annual average rainfall is 3.334mm and humidity is 70%. The annual the average maximum and minimum temperature is 10°C and 30°C, respectively.

2.2 Study of Animals

For the purpose of the current study, 613 fresh feces were collected from the cattle housed in individual farmers, private and government farms in Sylhet division of Bangladesh.

Information regarding health history, identification, age, sex and breed of cattle were recorded. The farm health problems, number of cattle and the housing were also recorded to gain more information about the predisposing factors for infection with fascioliasis. The cattle were alienated into three groups: Young: < 3 years, Adult: 3-5 years and Old: > 5 years of age.

2.3 Collection of Fecal Samples

Freshly voided faeces or directly from rectum were collected from adult cattle and calves. After collection, the sample was kept on ice and brought to the laboratory. All faecal samples were collected in separate cups. To prevent potential cross contamination between faecal samples, separate disposable gloves were worn for each collected sample. Faecal samples collected in the field were kept refrigerated at 4°C, processed for the determination of parasite within 24 hours of collection.

2.4 Coprological Examination

Each samples of 20-25gm of faeces material were collected from each animal. The samples were clearly labelled with universal bottles preserved with 10% formalin and each sample was clearly labeled with animal′s identification (age, sex), date and place of collection. Samples were packed and dispatched in a cool box to avoid the development of eggs and hatching. The coproscopic examination was performed to detect the presence of fasciola eggs using the standard sedimentation techniques [15]. The egg of fasciola was identified by a drop of methylene blue solution was added to the sediment to differentiate between eggs of paramphistomum species and fasciola species where eggs of fasciola species show yellowish colour while eggs of Paramphistomum species stain by methylene blue [15].

2.5 Collection of Liver Samples

During the study year, the affected cattle liver with gall bladders were collected from regional slaughter houses and examined to record the prevalence and economic significance of this disease in a systematic survey.

2.6 Pathological Examination of liver

Necropsies of slaughter animals were conducted and 215 livers were checked for the presence of parasites. Through palpation and incision of dilated or thickened bile ducts, gross pathological lesion of each diseased liver was established and recorded. Records of numbers slaughtered, source of slaughtered stock and the liver lesions were observed and condemned were noted down.

2.7 Statistical Analysis

Among the male and female cattle, variations in the prevalence of fascioliasis on the basis of different age groups, season, sex and their location. MSExcel 2010 and SPSS version 20 was used for data entry, coding, cleaning and analysis. Data was presented using graphs and tables. Prevalence was analyzed with Chi-square, ANOVA and Logistic Regression test by SPSS version 20.

3. RESULTS AND DISCUSSION

Among 613 faecal samples examined, 119 (19.41%) were found infected with *Fasciola spp*. in Sylhet division. Samples were examined microscopically using direct smear and standard sedimentation methods. Liver samples from 215 slaughtered animals were conducted and livers were checked, 52% were found positive with *Fasciola spp*. The prevalence of fascioliasis was found to be associated with age, sex and season as revealed by the

multivariate analysis of risk factors. Among multivariable age statistically significant in both examination which was considered to the calculated P- value was less than 0.05 that was shown in table 1.

Table 1: Animal-level prevalence of fascioliasis in cattle at Sylhet division of Bangladesh

Factors		Variables	No.of Examined Animals	No.of Affected Animals	Prevalence(%)	Total Prevalence(%)	P-value	Total examined Animals
Coprological examination	Age	less than 3 years	146	15	10.27	19.41	0.002	613
		Between 3-5 years	350	74	21.14			
		More than 5 years	117	30	25.64			
	Sex	Female	484	94	19.42			
		Male	129	25	19.37			
Abattoir survey	Age	Between 3-5 years	160	32	20	24.18	0.018	215
		More than 5 years	55	20	36.36			
	Sex	Female	30	8	26.66			
		Male	185	44	23.78	24.18	0.818	

Table 2: Seasonal prevalence of fascioliasis in cattle at Sylhet division of Bangladesh

Samples	Name of Seasons	No. of Animals Examined	No. of Affected Animals	Prevalence (%)	Total Prevalence (%)	P-value	Total examined Animals
Coprology	Summer	126	18	14.28	19.41	0.114	613
	Rainy	167	40	23.95			
	Winter	320	61	19.06			
Abattoir survey	Summer	113	22	19.46	24.18	0.156	215
	Rainy	87	27	33.03			
	Winter	15	3	20.00			

Table 3: Regional prevalence of fascioliasis in cattle at Sylhet division of Bangladesh

Regions	No. of Animals Examined	No. of Affected Animals	Prevalence (%)	Total Prevalence (%)	Total examined Animals
Sylhet sader	435	73	16.78		
Habiganj	58	17	29.31		
Moulvibazar	78	20	25.64	19.41	613
Sunamganj	42	9	21.42		

Economic losses

The total weight of 215 livers was approximately 752kg and the weight of condemned mass from 52 fascioliasis affected liver was 182 kg this was 179.21 kg of the total weight. The monetary value of 752 kg liver was calculated to be US$ 4574.20 and the monetary value of 182 kg condemned liver was US$ 1134.66 (Table 3). Based on this, the expected monetary loss due to the condemnation of liver per slaughtered cattle in the population was US$ 6.23 and the expected monetary losses per 1000 slaughtered cattle in the population would be US$ 2189.78.

Table 4: Economic losses due to condemnation of fascioliasis affected liver of cattle.

Categories	Description
Weight (kg) of 215 livers	752
Weight (kg) of the condemned part from 52 fascioliasis affected livers.	182
Percent of condemned liver tissue due to fascioliasis in the surveyed population	179.21
Market value of 215 liver that is 752 kg liver tissue	US$ 4574.20
Market value of condemned 182 kg mass of liver	US$ 1134.66
Expected average monetary loss due to the condemnation of liver per slaughtered cattle	US$ 6.23
Expected average monetary loss due to the condemnation of liver per 1000 slaughtered cattle	US$ 2189.78

In this study, the coprological prevalence of fascioliasis, its epidemiology and economic significance were measured in cattle in the Sylhet division of Bangladesh. The prevalence found in this study was lower than the earlier findings of Rahman and Mondal [11] who reported a 53% prevalence of bovine fascioliasis in Bangladesh. The rate of infection of fasciola may vary in different agroclimatic conditions as observed in Pakistan by other contributor [17]. Similarly, the prevalence of fascioliasis varied among various districts of Bangladesh. Chowdhury *et al* [12] examined faecal samples of cattle from Savar, Dhaka, Bangladesh and found 19.7% samples positive for fascioliasis. Affroze *et al* [13] recorded a 31.1% coprological prevalence of fascioliasis in Netrokona district, Bangladesh. The climatic condition and geographic position of the locality may influence the type and severity of parasitic infestation in grazing animals [18]. Fascioliasis more prevalent in lowland tropical areas as *Lymnea auricularia* (the intermediate host snail of Fasciola) breeds throughout the year in these favourable habitats [19]. The lower infection rate found in Chittagong district was 14.8% in another study [12].

Among the age group, a considerably high rate of infection was found in adult cattle. This result was in agreement with the earlier findings [7,18]. The highest level of infection in the older group i.e., above 6 years (62.62%) followed by in age groups of 4-6 years (57.28%), 2-4 years (42.56%) and up to 2 years (17.87%) [17]. Affroze *et al* [13] also reported that cattle over 4 years of age had the highest (33.3%) prevalence of fascioliasis in Netrokona district in Bangladesh. High prevalence in the adult in this study could be due to the intake of parasites for a longer period and their grazing habit close to waterlogged areas.

Between the sex groups, considerably high rate of infection was found in female. This result which was in agreement with the result of other workers [8,18], they observed a higher

prevalence in females as compared to males. This finding is also in conformity with the previous results [12].

Prevalence of fascioliasis in cattle was found to be high during the rainy season. The fascioliasis in cattle was high in 31.71% in winter, followed by summer (22.45%) and (36.84%) rainy seasons [20]. Climate conditions, particularly rainfall, were with differences in the prevalence of fasciola infection because this was suitable for intermediate hosts like snails to reproduce and to survive longer under moist conditions [21]. The prevalence found in this study was lower than the earlier findings [22] where out of 384 fecal and liver samples tasted, a prevalence of 43.23% and 90.88% was found respectively. The lower infection rate found in goat in Sylhet division was 20.75% in the study [8]. According to other researchers [23], the prevalence of due to fascioliasis decreased from 7.37, 1.80 and 4.41% in 1999–2000 to 4.64, 1.12 and 2.80% in 2007–2008 for cattle, sheep and goats, respectively.

According to the study of Hassan Khoramian [24], the overall 3.28% of the livers were found to be infected. For total number of sheep, goats and cattle slaughtered annually in region study, it was estimated that 7505 livers were infected and total annual economic losses of fascioliasis of studied animals were 41 784 USD (based on market prices in the study period). Of this, 23360 USD, 30240 USD and 15 400 USD were associated with the fascioliasis of sheep, goats and cattle, respectively. The economic importance of fascioliasis has so far been reported by estimating the loss due to condemnation of liver in affected cattle [3,25, 27].

4. CONCLUSION

Prevalence of bovine fascioliasis at Sylhet division of Bangladesh is attributed by multifactorial risk factors which comprise host, parasite and environmental effects. The prevalence was significantly affected by sex, age and seasons of the year. Higher prevalence of bovine fascioliasis was recorded in female cattle than male and older (>5years) than younger ones. As the intermediate host is endemic in high rainfall and waterlogged area, Sylhet region is suitable for surviving the intermediate host. *Fasciola gigantica* infections in cattle are endemic and widespread in Sylhet. The faeces collected from animals in farm condition that's why the prevalence was lower compared to free ranged animals. So, the control measures should be taken by the destruction of the intermediate host (snail population). Avoiding low lying pastures have also significantly important for controlling fluke infections. Periodic anthelmintic treatment should be given to get the maximum benefits from cattle. Liver condemnation due to fascioliasis had caused enormous economic income loss to the meat sellers. The majority of the farmers had heard about fasciolosis but were not aware of its cause and the fact that it can infect human beings proving that it has not been given the attention it requires making it a neglected disease of significant public health importance. Based on the research, selective and periodic use of anthelmintics in cattle against liver fluke infection as treatment will reduce the treatment cost as well as losses from the liver condemnation by the disease in cattle population in Bangladesh.

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CONFLICT OF INTEREST

The authors declare that there is no conflicting interest with regards to the publication of this manuscript.

REFERENCE

1. Maje N, Mathewos S, Desissa F, Regassa A. Cross-sectional study on bovine fasciolosis: prevalence, coprological, abattoir survey and financial loss due to liver condemnation at Areka Municipal Abattoir, Southern Ethiopia. J Vet Med Anim Health. 2015; 7(1): 33-38.
2. WHO 2005: Report of the Who Informal Meeting on Use of Triclabendazole in Fascioliasis Control. Geneva: World Health Organization.
3. Magaji AA, Ibrahim K, Salihu MD, Saulawa MA, Mohammed AA Musawa AI. Prevalence of Fascioliasis in Cattle Slaughtered in Sokoto Metropolitan Abattoir, Sokoto, Nigeria. Adv Epidemiol. 2014, http://dx.doi.org/10.1155/2014/247258
4. Ejeh EF, Paul BT, Lawan FA, Lawal JR, Ejeh SA, Hambali IU. Seasonal prevalence of bovine fasciolosis and its direct economic losses due to liver condemnation at Makurdi abattoirs north central Nigeria. Sokoto J Vet Sci. 2015; 12(2), 42-48.
5. Fabiyi JP, Adeleye GA. Bovine fasciolosis on the jos plateau, Northern Nigeria with particular referent to economic importance. Bull Anim Health Prod Afr. 1982; 30(1), 41-43.
6. Elmonir W, Mousa W, Sultan K. The prevalence of some parasitic zoonoses in different slaughtered animal species at abattoir in the mid-delta of Egypt; with special reference to its economic implications. Alexandria J Vet Sci. 2015; 47: 97–103.
7. Molina E, Gonzaga EA, Lumbao LA. Prevalence of infection with *Fasciola gigantica* and its relationship to carcass and liver weights, and fluke and egg counts in slaughter cattle

and buffaloes in Southern Mindanao, Philippines. Trop Anim Health Prod. 2005; 37(3): 215-221.

8. Hossain MM, Paul S, Rahman MM, Hossain FMA, Hossain MT, Islam MR. Prevalence and economic significance of caprine fascioliasis at Sylhet district of Bangladesh. Pak Vet J. 2011; 31: 113-116.

9. Usip LP, Ibanga ES, Edoho HJ, Amadi EC, Utah E. Prevalence of fascioliasis and the economic loss of condemned liver due to Fasciola infection in cattle slaughtered at three abattoirs in Eket Urban, Akwa Ibom State of Nigeria. Global Adv Res J Food Sci Technol. 2014; 3: 54-75.

10. Berando CC, Carneiro MB, Avelar BK, Donatele DM, Martin I, Priera MG. Prevalence of liver condemnation due to bovine fasciolosis in Southern EspiritoSanto: emporal distribution and economic losses. Rev Bras Parasitol Vet. 2011; 20: 49-53.

11. Rahman MH, Mondol MMH. Helminth parasites of cattle (*Bos indicus*) in Bangladesh. Indian J Parasitol. 1983; 7: 173-174.

12. Chowdhury SMZ, Mondol MMH, Islam FMS, Taimur MJFA, Biswas HR, Ershaduzzaman M. Prevalence of fascioliasis in cattle in Savar,Dhaka. Indian Vet J. 1994; 71: 121-123.

13. Affroze S, Begum N, Islam MS, Rony SA, Islam MA, Mondal MMH. Risk factors and gross Pathology of bovine liver fluke infection at Netrokona District, Bangladesh. J Anim Sci Adv. 2013; 3: 83-90.

14. Anne MZ, Gray MC. Veterinary clinical Parasitology, 7th edition. Blackwell Publishing. 2006; 185-210.

15. Soulsby EJL. Helminths, Arthropods and Protozoa of Domisticated Animals. 7th Edition, Balliere, Tindall and Cassel, London. 1982; p 809.

16. Hanson J, Brian P. The epidemiology,diagnosis and control of helminthes parasites of ruminants. A handbook Rome: Food and Agricultural Organization of the United Nations. 1994; p72.
17. Bhutto B, Arijo A, Phullan MS, Rind R. Prevalence of Fascioliasis in buffaloes under different agro-climatic areas of Sindh Province of Pakistan. Int J Agric Biol. 2012; 14: 241-245.
18. Arambulo PV, Moran N. The tropics and parasitic diseases of animals- their impact on animal and human health. Int J Zoonoses.1981; 8: 5-19.
19. Chartier C, Ngota A, Lonu L, Cabaret J. Dynamics of *Lymnaeanatalensis* populations in the Bunia area (Ituri, Haut- Zaire). Ann Parasitol Hum Comp. 1990; 65: 177-182.
20. Lucky NS, Hossain MK, Roy AC, Haque MM, Uddin AHMM, Islam MM, Howlader MMR. A longitudinal study on clinical diseases and disorders of cattle and goats in Sylhet, Bangladesh. J Adv Vet Anim Res. 2016; 3: 24-37.
21. Ahmed EF, Markvichtr K, Tumwasorn S, Koonawootrittriron S, Choothesa A, Jittapalapong S. Prevalence of *fasciola spp* infections of sheep in the Middle awash River Basin, Ethiopia. Southeast Asian J Trop Med Public Health. 2007; 38: 51-57.
22. Ayalew S, Endalkachew N. Prevalence and risk factors of bovine and ovine fasciolosis, and evaluation of direct sedimentation sensitivity method at Bahir-Dar Municipal Abattoir, Northern Ethiopia. Ethiop Vet J. 2013; 17: 1-17.
23. Ahmadi NA, Meshkehkar M. Prevalence and long term trend of liver fluke infections in sheep, goats and cattle Slaughtered in Khuzestan, Southwestern Iran. J Paramed Sci. 2010; 1: 26-31.
24. Khoramian H, Arbabi M, Osqoi MM, Delavari M, Hooshyar H, Asgari M. Prevalence of ruminants fascioliasis and their economic effects in Kashan, center of Iran. Asian Pac J Trop Biomed. 2014; 4: 918-922.

299 25. Mebrahtu G, Beka K. Prevalence and Economic Significance of Fasciolosis in Cattle
300 Slaughtered at Dire-Dawa Municipal Abattoir, Ethiopia. J Vet Adv. 2013; 3: 319-324.
301 26. Chen J-X, Chen M-X, Ai L, Xu X-N, Jiao J-M, Zhu T-J, Su H-Y, Zang W, Luo J-J, Guo
302 Y-H, Lv S, Zhou X-N. An Outbreak of Human *Fascioliasis gigantica* in Southwest China.
303 PLoS ONE. 2013; 8(8): 715-20.
304 27. Chakraborty, P., & Prodhan, M. A. M. (2015). Coprological prevalence of bovine
305 fascioliasis, its epidemiology and economic significance in Chittagong district,
306 Bangladesh. *Livestock Research for Rural Development*, *27*, 11-14.