June 30, 2022

Prevalence of Bovine Clinical Fasciolosis at Kotalipara Upazila of Gopalganj district of Bangladesh

Author's Details:

Md. Rafiul Islam[1], Md. Murshed Hasan Mustafa[1,2], Md. Mukhlesur Rahman[2], Md. Abdul Alim[3], Md. Abul Hashem[1]

[1] Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD), LGRD & Cooperatives Ministry, Kotalipara, Gopalganj, Bangladesh

[2] Department of Animal Science, Bangladesh Agricultural University, Mymensingh -2202

[3] Department of Parasitology, Bangladesh Agricultural University, Mymensingh-2202

[*]Corresponding Author: Md. Murshed Hasan Mustafa, Deputy Director (Livestock), Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD), LGRD and Cooperatives Ministry, Kotalipara, Gopalganj, Bangladesh

E-mail address: murshed9137@yahoo.com

Received Date: 27-Apr-2022 Accepted Date: 29-May-2022 Published Date: 30-June-2022

Abstract

This study was aimed to see the prevalence of fasciolosis in cattle caused by Fasciola gigantica at Kotalipara upazila of Gopalganj district of Bangladesh. Study period was from August, 2020 to February, 2021 through field survey and laboratory analysis of carpological examinations. A total of 230 faecal samples of cattle showing emaciation, diarrhea and weakness were collected from different unions of Kotalipara upazila. Examination of the faecal samples by sedimentation technique revealed an overall prevalence of 47.83% fasciolosis in cattle. The highest prevalence of fasciolosis was detected in the young cattle of 1-2 years aged group (50.88%) followed by the adult cattle of >2-4 years of age (45.71%) and the older cattle of > 4 years of age (43.48%). Significantly ($p<0.05$) higher prevalence of clinical fasciolosis was detected in female cattle (56.06%) than in their male counterparts (36.73%). While considered the breed, the prevalence was significantly higher in cross-bred (59.30%) than in local/ indigenous (40.83%) cattle. This study suggests that fasciolosis is endemic in cattle in Kotalipara upazila of Gopalganj district and sex and breed of the cattle are important risk factors for the prevalence of clinical fasciolosis in cattle. The effective measures are needed for controlling this malady with a view to profitable livestock farming in the study area.

Key words: *Cattle, endemic, Fasciolosis, incidence, parasitic disease, risk factors*

Introduction

Livestock is an important sub-sector of agriculture that contributes significantly in national economy of Bangladesh (Basest et al 2002; Begum et al 2007; Mustafa et al 2020, 2021). Low productivity is a common feature of livestock of Bangladesh may be due to the low nutritional level and disease prevalence (Barman et al 2017; Kawsar et al 2006; Mazed et al 2004; Rahman et al 1997, 1999, 2002; Sarkar et al 2008). Among many other causes, parasitism is considered as a major obstacle in the growth and development of livestock in the tropics and subtropics including Bangladesh (Mahfooz et al 2008). Of the parasitic diseases, fasciolosis is an important food-and water-borne parasitic zoonosis which is caused by liver flukes of the genus *Fasciola* (Platyhelminthes: Digenea: Fasciolidae) (Mas-Coma et al 2005 and Zhou et al 2008). Fasciolosis is responsible for liver disorders in ruminant hosts and it leads to a reduction in livestock productivity. It is recognized as one of the most pathogenic and economically important helminth diseases of the domesticated ruminants (Lessa et al 2000; Taylor et al 2016). In Bangladesh fasciolosis is one of the most prevalent parasitic disease in cattle, buffaloes, goats and sheep (Nooruddin and Islam, 1996; Alim et al 2004; Hossain et al 2011). The animal contracts the infection through ingestion of infective metacercaria with grass and straw. Exsheathment of the metacercariae occurs in the duodenum and the juvenile *Fasciola* migrate in the hepatic parenchyma and finally mature in the bile ducts and gall bladder (Troncy, 1989;

Taylor et al 2016). The development of fasciolosis involves the presence of snail intermediate host (*Lymnaea* spp.), suitable habitats for the snails and environmental factors such as high humidity, adequate temperature and rainfall.

The migrating *Fasciola* causes extensive liver damage that may cause acute death. Chronic fasciolosis in ruminants causes substantial economic losses to rural agricultural communities and commercial animal producers worldwide due to production losses associated with reduced feed conversion efficiency, weight loss and emaciation, infertility, condemnation of affected livers and death of infected animals (Torgerson and Claxton 1999; Spithill et al 1999; Siddiki et al 2010; Abunna et al 2010). The pathogical condition aggravates when fasciolosis and infection with *Gigantocotyle explanatum* occurs concomitantly (Alim et al 2000). Recently, worldwide losses in animal productivity due to fasciolosis were conservatively estimated at over US $ 3.2 billion per annum. Additionally, fasciolais is also an emerging zoonosis throughout the world (Lazara et al 2010).

Bangladesh has a tropical monsoon climate characterized by wide seasonal variations in rainfall, high temperatures, and humidity. The geo-climatic conditions of Bangladesh are highly favorable for the growth and multiplication of parasites. Due to the tropical climate, the causal agent *Fasciola gigantica* is prevalent in this part of the world (Amin & Samad, 1988). Fascioliais by *Fasciola giganctica* is distributed throughout Bangladesh including the north western semi-arid Barid tract (Rahman et al 2019) and the southernmost off shore Saint martin Island (Yasin et al 2018).

Considering the economic importance and pathological effects of liver fluke infection in ruminants, several research works have been performed in Bangladesh and the prevalence of fasciolosis in cattle in various parts of Bangladesh varies from 19-53% (Rahman and Mondal 1983, Chowdhury et al 1994, Affroze et al 2013, Yasin et al 2018).

Over the last two decades, there is introduction of extensive irrigation system throughout the country which provides ideal habitats of the vector snails in the dry season. This condition is giving more chances of development of the infective metacercariae and eventually infection in cattle and other ruminants even in the highland areas including the Barind Trcats (Rahman et al 2019). Because of global warming there are great changes in climatic condition which is highly reflected in Bangladesh. It is assuming that the changed climatic conditions, especially, higher temperatures and humidity would affect animal health and production through emergence end re-emergence of bacterial, viral and parasitic diseases. To cope with the changing condition and adopt different strategies for sustainable agricultural development, the Government of Bangladesh has taken some initiatives .Women and Men in the family play a great role in the sustainable livestock development in Bangladesh (Mustafa MMH 2022).The Bangladesh Delta Plan 2100 (21th century) is one of that initiative, where approaches regarding Adaptation-mitigation Strategy in Livestock Sector has been undertaken. The southern and costal zones of Bangladesh are primarily affected due to global warming and climate changes Recently, the Government of Bangladesh has taken project for i) Assessment of potential threats to the Poultry sector and Livestock sector, and development of adaptive measures and dissemination among farmers. ii) Strengthening veterinary services systems, including animal health measures in light of the likely decrease of disease prevalence (GED 2018; Delta Plan 2100). Under the above mentioned Delta Plan 2100 and activities, this pioneering work has been undertaken to determine the prevalence and risk factors of fasciolosis in cattle at Kotalipara upazilla of Gopalganj district in Bangladesh.

Materials and Methods

Study area and duration

This cross sectional study was conducted during the period of August, 2020 to February, 2021 at Kotalipara Upaziala (the administrative unit under a district. Usually one district consists of 3-13 upazilas in Bangladseh) of Gopalganj District of Bangladesh. Kotalipara is a part of the south Coastal belt of

Bangladesh. It is located in between 22°.52' and 22.08' N and 89°.55' and 89°08' east latitude. . Kotalipara upazila of Gopalganj district is southern area of Bangladesh and the region occupies extensive low-lying areas between the Ganges river floodplain and the Ganges tidal floodplain. The low lying marshy areas in Kotalipara upazila remain water logged in most of the seasons of the year (Banglapedia 2021).

Selection of cattle

A total of 230 cattle clinically showing the signs of fasciolosis such as depression, dullness, inappetite, weakness, rough hair coat, diarrhea, emaciation, bottle jaw formation, emaciation (body with less flesh, externally remarkable body prominence with rough hair coat) (Soulsby 1982; Taylor et al 2016) were randomly selected for this study to determine the prevalence of fasciolosis. The information regarding age, sex and health condition were collected through a pretested structured questionnaire. The selected cattle were categorized into three age groups viz. young (1- 2 years, n= 114), adults (>2 years – 4 years, n= 70) and older (> 4 years, n = 46). The cattle were categorized into male (n = 98) and female (n = 132) groups to determine the influence of sex on susceptibility of cattle to fasciolosis. Top determine the influence of breed the sampled cattle were divided into local/indigenous (n = 144) and cross-bred (n = 86). The age of the cattle was determined by physical examination of teeth, from the record books and by questioning the owners. The history was from individual farmer by cross questioning. Emaciation and diarrhea were recorded after physical and clinical examinations. All relevant information were taken and recorded carefully during collection of faecal samples.

Faecal sample collection and preservation

The fecal samples were collected early in the morning, from 7-8 am. Before collection, the cattle were restrained properly and all possible hygienic measures including wearing of apron, hand gloves and gumboot were taken to avoid contamination and protect personal hygience. About 20 g of fresh faeces was collected directly from rectum of each animal. Also, the faecal samples were collected from the top of the voided faecal mass when the animals were found in the act of defecation. Each sample was kept in separate plastic vial, soaked with 10% formalin, capped carefully and numbered properly. The vials containing the faecal samples with all required information were brought to the Parasitology Laboratory, Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD), Gopalganj for examination.

Examination of fecal samples and identification of eggs

The faecal samples were examined by Simple Sedimentation Technique as described by Thienpont et al (1986). Briefly, 5 g of faeces were weighed and taken in a 100 ml graduated cylinder. Water was added up to the 50 ml marks of the cylinder. A homogenous suspension was made by vigorously shaking the mixture. The mixture was sieved through a plastic mess and the filtrate was taken in a 100 ml beaker. The beaker containing the filtrate was left for 30 min and the supernatant was decanted carefully without disturbing the sediment. One drop of the sediment was transferred on a clean glass slide and covered with a cover slip (24 × 36 µm). The slide was examined under a compound microscope (LABOMED, Los Angeles, CA, USA) using low power objective (10X). The eggs were identified by their characteristic morphological features (Soulsby 1982; Thienpont et al 1986). Each sample was examined in triplicate. Presence of single eggs of *Fasciola* sp. in one microscopic focus during coprological examination was recorded as positive and confirmatory for fasciolosis. The faecal sample examination results were correlated with the history and clinical findings of individual animal.

Statistical analysis

Data obtained were analyzed using *Z*-test, Chi-square (χ^2) test and a one-way analysis of variance with *post hoc* Duncan multiple comparison (SPSS software, version 16.0). A descriptive analysis was performed to interpret the data according to Kothari C .R (2007).

Results and Discussion

Overall prevalence of fasciolosis in cattle

A total of 230 faecal samples collected from the clinically suspected cattle were examined by sedimentation technique. Of the samples examined, 110 were found positive showing an overall 47.83% prevalence of fasciolosis in cattle in Kotalipara Upazila (Fig. 1). This result is in agreement with the previous findings of Islam et al (2022), Karim et al (2015), Mustafa et al (2022), Yadav et al (2015) and Abraham et al (2014). Karim et al (2015) reported an overall 66.14% prevalence of fasciolosis in cattle in Shahajadpur Upazila, Bangladesh. Yadav et al (2015) and Abraham et al (2014) reported overall 51.0 and 44.8% prevalence of fasciolosis in cattle in Nepal and Nigeria, respectively. Alim et al (2004) described 50.65% prevalence of fasciolosis in buffaloes in Bangladesh. However, Chakraborty and Prodhan (2015) reported 14.8% prevalence of fasciolosis in cattle in Chittagong district in Bangladesh which is much lower than the present findings. Lower prevalence of bovine fasciolosis (25.0%) was also described by Haleem et al (2016) in Pakistan. Prevalence of fasciolosis in cattle is attributed by multi-factorial risk factors which comprise host, parasite and environmental effects. High-rainfall areas favour development and survival of both the intermediate host snail and the developmental stages of the parasite Affroze et al (2013). It is established that sample size, sampling and fecal examination methods, geographical location and topography of the sampling areas, availability of snail intermediate hosts, variations in the hosts animal age, sex and nutritional conditions, duration of the study, season of the year and grazing management of the animals including the use of anthelmintics influence the prevalence of fasciolosis in host animals (Tembely et al 1995; Alim et al 2004; Khatun et al 2015 ; Mustafa et al 2022) which are also applicable to describe the causes of variations between the present findings and the earlier reports.

Clinical fasciolosis was more in the young cattle than in the older

The age susceptibility of cattle to fasciolosis was determined through this coprological study. And the results showed that the highest prevalence of clinical fasciolosis was in the young cattle of 1-2 years of age group (50.88%) and the lowest in older cattle of 4 years of age group (43.48%) (Table 1). This finding of more prevalence of fascioliasis in younger cattle is supported by the earlier report of Nath et al (2016) who reported that the young cattle of 6 to 18 months of age are more infected compared to adult animals. In contrasts to the present findings of Khandaker et al (1993), Sarder et al (2006), Karim et al (2015) in Bangladesh who reported that the prevalence of *Fasciola gigantica* were highest in cattle of more than 36 months of age and lowest in the age of less than12 months. Haleem et al (2016) and Bhutto et al (2012) from Pakistan also described that the prevalence of *F. gigantica* infection was higher in older cattle than in young cattle. The findings of the present study were varying from previous study findings. In present study young cattle (1-2 years old) were found more susceptible to clinical fascioliasis. This might be due to their more exposure to the metacercariae though grazing in the field. Now-a-days, the beef fattening and dairy cattle rearing has taken a small industrial shape even by the marginal farmers. Considering the economic benefit, for beef fattening the farmer's rear the cattle for short period of time (around 6 months) and usually the male cattle are reared. These animals are usually stall fed and regular anthelmintic therapy is given to keep them free from parasites. To get increased milk production the cross-bred dairy cows are preferred and the milking cows (over two years of age) receive special feeding and veterinary care compared to the young growing cattle of up to two years of age. Furthermore, it is very likely that the cattle infected with *Fasciola* parasites at younger age develop immunity that prevents them from infection at adult and older age, which is reflected in the present findings.

Prevalence of clinical fascioliasis in cattle of different sexes

In the present study, the prevalence of fasciolosis was higher (56.06%, 74/132) in female cattle than in their male counter parts (36.73%, 36/98) **(Fig. 2).** This result is similar to the previous findings of Affroze et al (2013**)**, Karim et al (2015) and Nath et al (2016) who described significantly higher prevalence of fascioliasis in female cattle than in the males. Bhutto et al (2012) reported that the prevalence of *Fasciola* infection in female cattle (45.08%) was as much as double compared to that of males (20.89%) in Pakistan. Alim et al. (2004) reported higher prevalence of fascioliasis in female buffaloes than in male buffaloes in Bangladesh. In contrast to the above reports, Haleem et al (2016) reported more prevalence of fascioliasis in male cattle (14%) than in the females (9.8%) in Pakistan. The factors such as high stress may be related with more prevalence of fascioliasis in females than in male cattle. The alternate pregnancy and lactation of

cattle obviously put them in stress due to periparturient relaxation in immunity as it happens in pregnant goats and ewes (Taylor et al 2016). While the management practices are considered, usually the low milk producing cows are less cared and usually they are grazed in the field. Furthermore, the for breeding purpose the cows are reared for longer time which also contribute to get more exposed to natural infection leading to more clinical fascioliasis in female cattle but females are physically and immunologically weaker than male cattle probably make them more prone to *Fasciola* infection Molina et al (2005) and Chowdhury et al (1994).

Cross-bred cattle were more susceptible to clinical fasciolosis

The breed susceptibility of cattle to fascioliasis was investigated in this study. The result showed that the significantly higher prevalence of clinical fascioliasis was found in cross-bred cattle (59.30%, 51/86) than in the local indigenous cattle (40.97%, 59/144) (**Fig. 3).** The present results are strongly substantiated by the previous reports of Khatun et al (2015) and Hoque et al (1998). Khatun et al (2015) conducted a research in Chittagong district of Bangladesh and reported that the prevalence of fascioliasis was significantly higher in cross-bred (64.29%) cattle than in local indigenous (35.71%). Hoque et al (1998) reported that the mortality rate of cross-bred calves was more than that of indigenous calves due to fascioliasis in Bangladesh. The reasons behind more prevalence of infection in cross-bred cattle than in the local indigenous cattle are difficult to describe. However, it might be due to the genetic makeup of the cross-bred cattle that mare them more susceptible to the natural infection of fascioliasis.

Table 1: Prevalence of clinical fasciolosis in cattle of different age groups

Age group (year)	No. of cattle examined	No. of cattle infected	Prevalence (%)
≥1-2	114	58	50.88
>2-4	70	32	45.71
>4	46	20	43.48
Overall	230	110	47.83

Fig. 1. Showed that Overall prevalence of clinical fasciolosis in cattle at Kotalipara Upazila of Gopaljang district of Bangladesh. The faecal samples were examined by simple sedimentation technique.

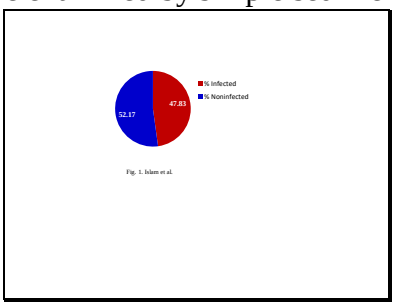
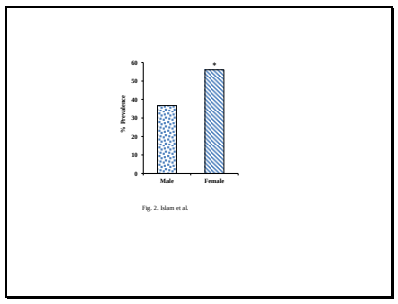


Fig. 1. Overall prevalence of clinical fasciolosis in cattle at Kotalipara Upazila of Gopaljang district of Bangladesh. The faecal samples were examined by simple sedimentation technique.

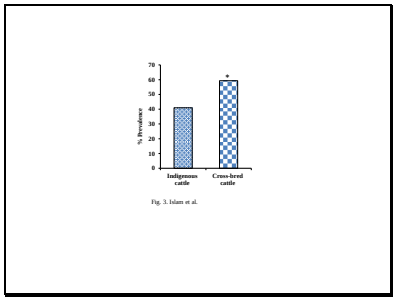
Fig. 2. found that Prevalence of clinical fasciolosis in cattle of different sexes at Kotalipara Upazila of Gopalganj district of Bangladesh. * Iindicates that the value is significantly ($p<0.05$) higher than the other in the same column



.

Fig.2: Prevalence of clinical fasciolosis in cattle of different sexes at Kotalipara Upazila of Gopalganj district of Bangladesh. * Iindicates that the value is significantly ($p<0.05$) higher than the other in the same column.

Fig. 3. Showed that Prevalence of clinical fasciolosis in indigenous and cross-bred cattle of at Kotalipara Upazila of Gopalganj district of Bangladesh. * Indicates that the value is significantly ($p<0.05$) higher than the other in the same column.



. Fig3:Prevalence of clinical fasciolosis in indigenous and cross-bred cattle of at Kotalipara Upazila of Gopalganj district of Bangladesh. * Indicates that the value is significantly ($p<0.05$) higher than the other in the same column.

Furthermore, from the studies and the very beginning of life, most of the cross-bred cattle remains malnourished as their nutrient requirements cannot be fulfilled by the local dams. This it pertinent to assume that this nutritional deficiency renders the cross-bred cattle susceptible to many diseases including fascioliasis which is obviously exhibited by more prevalence of clinical fascioliasis among them in this study.

Conclusions

In spite of putting sincere efforts there were some limitations of this study such as lack of control groups, keeping uniformity in selection of animals and accurate measuring of age, physical conditions, clinical signs etc. which might have some influence on the results. However, this research work indicates that the prevalence of clinical fasciolosis is alarmighly high and is one of the major health problems of the cattle in Kotalipara Upazila of Gopalganj district of Bangladesh. Effective control measures are essentially needed to control fasciolosis in cattle as well as in other host animals.

References

Abraham JT and Jude IB 2014. Fasciolosis in cattle and goat slaughtered at Calabar abattoirs. *Journal of Biology, Agriculture and Healthcare* 4: 34-40.

Abunna F, Asfaw L, Megersa B and Regassa A 2010. Bovine fasciolosis: coprological, abattoir survey and its economic impact due to liver condemnation at Soddo municipal abattoir, Southern Ethiopia. *Tropical Animal Health and Production* 42**:** 289-292.

Affroze S, Begum N, Islam MS, Rony SA, Islam MA and Mondal MMH 2013 .Risk factors and gross pathology of bovine liver fluke infection at Netrokona district, Bangladesh. *Journal of Animal Science Advances* 3(2): 83-90.

Alim MA, Islam MK, Karim MJ, Mondal MMH. 2004. Fasciolosis and biliary amphistomiasis in buffaloes in Bangladesh. Bangladesh Vet J. 38: 1–9.

Alim MA, Mondal MMH, Islam MK, Khan MAHNA. 2000. A note on the pathology of *Fasciola gigantica* and *Gygantoctyle explanatum* in the livers and gall bladders of buffaloes. *Bangladesh Veterinarian* 17: 124–125.

Banglapedia 2021. National Encyclopedia of Bangladesh. https://en.banglapedia.org/index.php/Agroecological_Zone.

Barman TC, Hossain MM, Rahman MM, Ali MY and Sarker NR 2017. An assessment of socio-economic conditions of the farmers related to goat fattening in Rangpur district of Bangladesh. *Asian-Australasian Journal of Food Safety and Security* 1: 1-6.

Baset MA, Rahman MM, Ali ML, Mahbub ASM and Haque MN 2002. Effect of Urea Molasses Straw (UMS) on the performance of steers with supplementation of wheat bran. *Pakistan Journal of Biological Sciences* 5: 807-808.

Begum MAA, Hossain MM, M Khan, Rahman MM and Rahman SME 2007 .Cattle fattening practices of selected farmers in Panchagarh district. *Bangladesh Journal of Animal Science* 36: 62-72.

Bhutto B, Arijo A, Phullon MS and Rind R 2012 .Prevalence of fascioliais in buffaloes under different agroclimatic areas of Sindh province of Pakistan. *International Journal of Agriculture and Biology* 14 (2): 241-245.

Chakraborty P and Prodhan MAM 2015 .Coprological prevalence of bovine fasciolosis, its epidemiology and economic significance in Chittagong district, Bangladesh. *Livestock Research for Rural Development* 27:11-14.

Chowdhury SMZH, Mondal MMH, Islam FMS, Taimur MJFA, Biswas HR and Ershaduzzaman M 1994 Prevalence of fasciloiasis in cattle in Saver, Dhaka. *Indian Veterinary Journal* 71(2**):** 121-123.

Delta plan 2018 Bangladesh Delta Plan 2100 .Volume 1: Strategy. General Economic Division (GED), Bangladesh Planning Commission, Ministry of Planning, Government of the People"s Republic of Bangladesh. 403-405 pp.

Haleem S, Shadab, Faiza, Sadaf Niaz, Hameed Ur Rehman, Shazeb Sajad, Naveeda Akhtar Qureshi and Muhammad Kabir 2016. Prevalence of fasciolosis in cows and sheep in district Mardan (KPK), Pakistan. *Journal of Entomology and Zoology Studies* 4 (3): 330-334.

Hoque MM, Alam M and Rahman ML 1998 Helminth infection in cattle of Feni district of Bangladesh. *The Bangladesh Veterinarian* 9**:** 105-106.

Hossain MM, Paul S, Rahman MM, Hossain FMA, Hossain MT, Islam MR 2011. Prevalence and economic significance of caprine fasciolosis at Sylhet district of Bangladesh. *Pakistan Veterinary Journal* 3: 113–116

Islam M R, Mustafa MMH, Rahman MM and Alim M A 2022. Study on the parasitic infestations in calves at BAPARD surroundings coastal south region in Bangladesh. *International Journal of Scientific Engineering and Applied Science* 8 (5): 264-275.

Karim MR, Mahmud MS and Giasuddin M 2015. Epidemiological study of bovine fasciolosis: prevalence and risk factor assessment at Shahjadpur upazila of Bangladesh. *Immunology and Infectious Diseases* 3(3): 25-29.

Kawsar SM, Rahman MM, Rahman SME, Hossain MM and Huq MA 2006. Growth, carcass and non-carcass traits of Black Bengal goats due to urea molasses block supplementation. *International Journal of Biological Research* 2: 1-5.

Khandaker MMU, Chanda PK and Rahman E 1993. Hepatic changes of cattle naturally infected with *Fasciola gigantica*. *Bangladesh Veterinary Journal* 3**:** 33-44.

Khatun MS, Assaduzzaman M, Pallab MS, Chakraborty P 2015. Risk factors analysis of fasciolosis in two geo-climatic regions of Bangladesh. *International Journal of Scientific Research* 4 (11): 41-43.

Kothari CR 2007. Methods of Data collection, Analysis and Interpretation. A Book of Research Methodology, Methods & Techniques. 2nd edition, 95, 344 -360 pp.

Lazara R, Vazquez A, Domenech I and Robertson LJ 2010. Fasciolosis: can Cuba conquer this emerging parasitosis? *Trends in Parasitology* 26**:** 26-34.

Lessa CS, Scherer PO, Vasconcelos MC, Freire LS, Santos JAA and Freire NMS 2000 .Registro de *Fasciola hepatica* equines (*Equus caballus*), caprinos (*Capra hicus*) ovinos (*Ovis aries*), no municipio de Itaguai, Rio de Janeiro, Brasil. *Revista Brasileira de Ciência Veterinaria* **7:** 63-64.

Mahfooz A, Masood MZ, Yousaf A, Akhtar N and Zafar MA 2008. Prevalence and anthelmintic efficacy of Abamectin against gastrointestinal parasites in horses. *Pakistan Veterinary Journal* 28**:** 76-78.

MaMMas- Coma, MD Bargues, MA Valero 2005. Fasciolosis and other plant-borne trematode zoonoses. *Int J Parasitol* 35: 1255–1278. doi:10.1016/j. ijpara.2005.07.010

Mazed MA, Islam MS, Rahman MM, Islam MA and Kadir MA 2004 .Effect of urea molasses multinutrient block on the reproductive performance of indigenous cows under the village condition of Bangladesh. *Pakistan Journal of Biological Sciences* 7 1257-1261.

Molina EC, Gonzaga EA and Lumbao LA 2005. 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. *Tropical Animal Health and Production* 37(3): 215-221.

Mustafa MMH, Islam MR, Rahman MM 2022. Epidemiological Investigation of Gastrointestinal (GI) Parasite at BAPARD Cattle Farm, Gopalganj in Bangladesh. *International Journal of Rural Development, Environment and Health Research* 6 (2): 8-16.

Mustafa MMH, Islam MR, Hossain MA 2022. Epidemiological Investigation of Paramphistomiasis in Cattle at Kotalipara Upazila Gopalganj District .International Journal of Modern Pharmaceutical Research(IJMPR) ,Volume 6,Issue 4,page no.17-20

Mustafa MMH, Islam MR, Rahman MM 2022. Epidemiological investigation of gastrointestinal (GI) parasite at BAPARD cattle farm, Gopalganj in Bangladesh. International *Journal of Rural Development, Environment and Health Research* 6 (2): 8-16.

Mustafa M M H, Islam M R, Rahman M M 2021 .Effect of ration on growth and cost of production during fattening of upgraded Shahiwal bulls. *Journal of Agriculture, Food and Environment* 2 (2): 44-48.

Mustafa MMH, MR Islam, MM Rahman 2020. Effect of feed on the performance of upgraded Holstein Friesian bulls during fattening at BAPARD cattle farm in Bangladesh. *Asian Journal of Medical and Biological Research* 6 (4): 761-767.

Mustafa MMH 2022. A Study on the Role of Women and Men in the Family -BAPARD Perspective. International Journal of Academic Multidisciplinary Research(IJAMR),Volume 6, Issue 4, page:303-312

Nath TC, Islam KM, Ilyas N, Chowdury JK and Bhuiyan JU 2016. Assessment of the prevalence of gastrointestinal parasitic infections of cattle in hilly areas of Bangladesh. *World Scientific News* 59: 74-84.

Nooruddin M, Islam KS 1996. Distribution and body size of *Fasciola gigantica* in livers of Bengal goats in Bangladesh. *Small Ruminant Research* 19: 189–191.

Rahman AR, Alim MA, Hossain MM, Yasin MG, Alam MZ, Hatta T, Anisuzzaman, Tsuji N, Mondal MMH 2019. Snail-borne trematodiasis in cattle in Barind tract of Bangladesh, an overlooked problem. *Jpn J Vet Parasitol* 18(2): 53-64.

Rahman MM, Habib S, Kadir MA, Islam MN, Islam MS 2002. Participation of rural people in cattle management practices in a selected area of Bangladesh. *Journal of Animal and Veterinary Advances* 1: 196-199.

Rahman MM, Akhter S, Rabbani MS, Hossain MM 1999. Indigenous knowledge on livestock practiced by

the farmers in Mymensingh district of Bangladesh. *Bangladesh Journal of Animal Science* 28 (1-2): 97-103.

Rahman MM, Akther S, Hossain MM 1997. Socio Economic Aspects of the farmers for livestock keeping in Mymensingh town adjacent areas. *Progressive Agriculture*. 8: 153-157.

Rahman MH and Mondal MMH 1983. Helminth parasites of cattle (Bos indicus) in Bangladesh. *Indian Journal of Parasitology* 7(2): 173-174.

Saleha AA 1991. Liver fluke disease (Fasciolosis): epidemiology, economic impact and public health significance. *Southeast Asian Journal of Tropical Medicine and Public Health* **91:** 361-364.

Sarder SA, Ehsan MA, Anower AKMM, Rahman MM and Islam MA 2006 .Incidence of liver flukes and gastrointestinal parasites in cattle. *Bangladesh Journal of Veterinary Medicine* 4: 39-42.

Sarkar MM, Hossain MM, Rahman MM and Rahman SME 2008. Effect of feeding urea molasses block on the productive and reproductive performances of Black Bengal doe. *Bangladesh Journal of Bangladesh Agricultural University* 6 39-46.

Siddiki AZ, Uddin MB, Hasan MB, Hossain MF, Rahman MM, Das BC, Sarker MS and Hossain MA 2010. Coproscopic and haematological approaches to determine the prevalence of helminthiasis and protozoan diseases of Red Chittagong Cattle (RCC) breed in Bangladesh. *Pakistan Veterinary Journal* 30(1): 1-6.

Soulsby EJL 1982. Helminths, Arthropods and Protozoa of Domesticated Animals, 7th edition, The ELBS and Baillier Tindall, London, UK.

Spithill TW, Smooker PM, Copeman DB 1999. *Fasciola gigantica*: epidemiology, control, immunology and molecular biology. In: (Ed. J.P. Dalton) Fasciolosis, CAB International Publishing, Wallingford, 465–525.

Taylor M A, Coop R L and Wall R L 2016. Veterinary parasitology.4th ed., Blackwell Publishing Ltd., Oxford.

Thienpont D Rochette F and Vanparijs OFJ 1986. Diagnosing Helmithiasis by Coprological Examination. 2nd ed., Janssen Research Foundation, Beerse.

Torgerson P., Claxton J. 1999. Epidemiology and control. In: (Ed. J.P. Dalton) Fasciolosis, CAB International Publishing, Wallingford, 113–149.

Tembely S, Coulibaly E, Dembele K, Kayentao O & Kouyate P 1995. Intermediate host populations and seasonal transmission of *Fasciola gigantica* to calves in central Mali, with observations on nematode populations. *Preventive Veterinary Medicine* 22 (1-2): 127-136.

Troncy PM 1989. Helminthes of livestock and poultry in Tropical Africa. In: Fischer. Manual of Tropical Veterinary Parasitology. pp. 63-73CAB international, UK

Yadav SK, Ahaduzzaman M, Sarker S, Sayeed MA, Hoque MA 2015. Epidemiological survey of fasciolosis in cattle, buffalo and goat in Mahottari and Dhanusha, Nepal. *Journal of Advance Parasitology* 2(3): 51-56.

Yasin MG, Alim MA, Anisuzzaman, Ahasan SA, Munsi MN, Chowdhury EH, Hatta T, Tsuji N, Mondal MMH. 2018. Trematode infections in farm animals and their vector snails in Saint Martin's Island, the southeastern offshore area of Bangladesh in the Bay of Bengal. *J Vet Med Sci* 80: 684-688.

Zhou P Chen N, Zhang RL, Lin RQ, Zhu XQ 2008 Food-borne parasitic zoonoses in China: perspective for control. *Trends in Parasitology* 24: 190–196. doi:10.1016/j.pt.2008.01.001.

Acknowledgements

The authors gratefully acknowledge Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD), Ministry of LGRD and Co-operatives, Gopalganj, Bangladesh for funding the research works. The authors also acknowledge the Department of Animal Science and the Department of Parasitology of Bangladesh Agricultural University, Mymensingh for their technical assistance.

Conflict of interest

The authors declare no competing interests regarding the submitted manuscript and the research works.