International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-8, Issue-5, May 2022
ISSN: 2395-3470
www.ijseas.com

Study on the parasitic infestations in calves at BAPARD surroundings coastal south region in Bangladesh

MR Islam[1], MMH Mustafa[1,2], MM Rahman[2] & MA Alim[3]

[1]Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD), Ministry of LGRD and Co-operatives, Gopalganj, Bangladesh

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

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

*Corresponding author: Md. Murshed Hasan Mustafa, Deputy Director (Livestock), BAPARD, Ministry of LGRD and Co-operatives, Kotalipara, Gopalganj, Bangladesh.

Mobile no. : +8801718361072

E-mail: murshed9137@yahoo.com

Abstract

The study was carried out to investigate the prevalence of gastrointestinal (GI) parasites and to determine the effects of different factors in the occurrences of GI parasitic infections in calves at Kotalipara upazila of Gopalganj district and Agailjhara upazilla of Barishal district during the period from December, 2019 to November, 2020. A total of 437 calves were selected randomly for the collection of fecal samples ageing up to 8 months. During fecal sample collection, a pretested questionnaire was used to record the age, sex, health condition, breed, and level of consistency of fecal materials of calves. The calves were divided into three age groups viz. ≤ 3 months, >3 to ≤ 6 months and > 6 to ≤ 8 months; different sex viz. male and female; different health status group viz. poor and normal; different breeds viz. Non-descriptive indigenous and crossbred. The ages of the calves were determined by interviewing the farmers or by examining the teeth. The health status of the calves was determined by visual observation. The fecal samples was taken either directly from the rectum of the animals or from the ground immediately after defecation using disposable gloves labeled and sterile stool containers containing SAAF solution (Sodium Acetic Acid Formalin). The samples were examined using standard coprological techniques like sedimentation and floatation techniques, and lugol's iodine and modified Ziehl-Neelson staining at BAPARD Laboratory on the day of collection. The overall prevalence of gastrointestinal parasitism was 45.54% (n=199/437) and commonly identified parasites were *Toxocara* spp. (19.91%), *Strongyloides* spp. (4.12%), *Fasciola* sp. (1.14%), *Moniezia* spp. (1.6%), *Giardia* sp. (10.3%) and *Cryptosporidium* spp. (7.09%). Among the factors, the age, sex and health status had significant effects on the GI parasitic infections in calves. Therefore, special care such as routine fecal examination for parasitism and proper deworming program should be taken to maintain good health and husbandry of calves for profitable livestock production.

Key words: GI parasitic infection, Prevalence and Factors, BAPARD surroundings Coastal Region.

Introduction

Livestock plays an important role in the economy of Bangladesh (Basest et al., 2003; Begum et al. 2007, Mustafa et al., 2020, 2021). Gastrointestinal parasitism is a world-wide problem (Regassa *et al.,* 2006). It is thought to be one of the major constraints that hinder the

development of livestock population (Kakar *et al*., 2008) and also adversely affects the health and productivity of animals (Radostits *et al.*,1994). The climatic condition of Bangladesh favors the growth, development and survival of various parasites or their intermediate hosts. It has been estimated that about 10% animals die annually due to parasitic diseases in the world (Chavhan et al., 2008). Previous studies in Bangladesh revealed that gastro-intestinal parasitic infections are widely prevalent in the country (Siddiki et al., 2009; Alim et al., 2011). In Bangladesh, 80% people in rural areas rear indigenous cattle (Siddiki et al., 2009), and most of the cattle have been originated from primitive and low productive encestors. The farmers usually rear their cattle under traditional husbandry practices. Nutritional status of the animas in general is not satisfactory as they are over-worked but under-fed or half-fed, which makes the animals susceptibile to diseases including different parasitic diseases. About 50% calves until 1-year of age die due to GP (Debnath *et al*., 1995). On the other hand, the adult cattle are also severely affected by parasitism as they are kept for a longer period of time in breeding or milk production purposes and often supply insufficient feed against their high demand (Rahman *et al*., 1998; Sardar *et al.*, 2006) resulting enormous economic losses. The losses caused by parasitic infections are in the form of lowered general health condition, retarded growth rate, diminishing the working efficiency, decrease milk and meat production, abortion; cost associated with preventive measures and reduces the disease resistance capability, which may ultimately lead to higher mortality (Silvestre *et al*., 2000). Parasitic problems are often neglected and overlooked as majority of the infected animals show a number of little obvious clinical signs during their productive life and their effects are gradual and chronic (Raza *et al*., 2010). Rahman and Ahmed (1991) reported that calves gained body weight by 400 gm/day when treated for parasitic diseases compared to 200 gm/day in non-treated calves. It was also reported that anthelmintic treated calves reached to sexual maturity in 24 months compared to 36-40 months by non-treated calves. Afazuddin (1985) estimated an annual loss of 0.1 million Bangladesh Taka due to parasitic diseases in Military Farm, Savar, Dhaka. Unfortunately, in Bangladesh the parasitic diseases are neglected or overlooked sometimes since the infected animals show little or no clinical signs (Alim *et al.*, 2012).

In this study, we selected two upazila of Gopalganj and Barishal district namely, Kotalipara and Agailjhara. The geo-climatic conditions of these upazila and the water logging and low lying areas are expected to favors the growth, development and survival of various parasites or their hosts. Besides, there are several factors, such as breed, age, sex, nutritional and immune status which may influence the occurrences of GI parasitic infections (Pfukenyi and Mukaratirwa, 2013). Although, previous studies in some selected areas of Bangladesh revealed wide prevalence of GI parasitism in livestock (Paul *et al.*, 2016; Ahmed *et al.*, 2015; Islam *et al.*, 2014), no precise report on the infections is available in calves of these areas. Considering this, the present research work was undertaken to determine the prevalence of GI parasitic infections of calves in Kotalipara upazila of Gopalganj district and Agailjhara upzilla of Barishal district and to evaluate the effect of geographic location, breed, age, sex, nutritional status and fecal consistency on occurrence of GI parasitism.

Materials and Methods

Study area

The study was conducted in different locations of in Kotalipara upazila of Gopalganj district and Agailjhara upazila of Barishal district (Fig. 1) during the period from December, 2019 to November, 2020. The low laying area is favorable for parasitic growth and development.

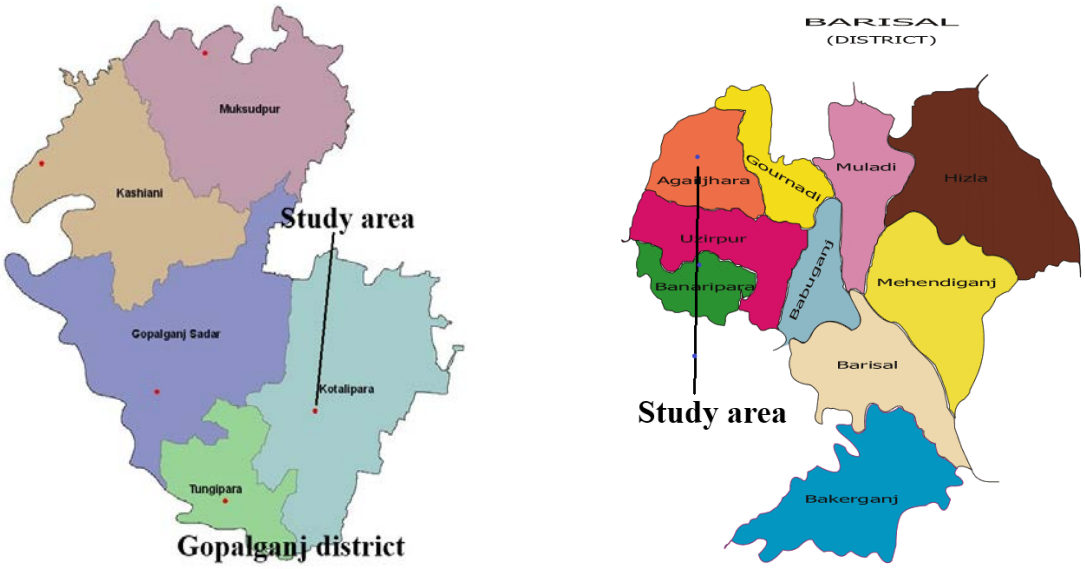


Fig. 1: Study area: BAPARD surroundings coastal region of Bangladesh

Study design and data collection

A cross-sectional study was conducted in randomly selected farmers of study areas during the period from December, 2019 to November, 2020. A total of 437 calves were selected randomly for the collection of fecal samples ageing up to 8 months. During fecal sample collection, a pretested questionnaire was used to record the age, sex, health condition, breed, and level of consistency of fecal materials of calves. The calves were divided into three age groups viz. ≤ 3 months, >3 to ≤ 6 months and > 6 to ≤ 8 months; different sex viz. male and female; different health status group viz. poor and normal; different breeds viz. Non-descriptive indigenous and crossbred. The ages of the calves were determined by interviewing the farmers or by examining the teeth. The health status of the calves was determined by visual observation. Well fleshed calves having no bony prominence and glistening hair coat was considered as calves with normal health. Calves with externally visible ribs and other bony prominence and rough hair coat were considered as poor health conditioned (Pinilla *et al*., 2018).

Fecal sample collection and preservation

The fecal sample from each calf was collected in labeled and sterile stool containers containing SAAF solution (Sodium Acetic Acid Formalin). The fecal samples was taken either directly from the rectum of the animals or from the ground immediately after defecation using disposable gloves. Before collection, the animals were restrained properly and all possible hygienic measures including wearing apron, hand gloves and gumboot were taken to avoid contamination. About 20-25 gram of feces was collected from each calf and transported to the laboratory in ice box, and examined as early as possible.

Examination of fecal samples

The fecal samples were analyzed using standard parasitological screening techniques namely, sedimentation followed by floatation technique to detect the eggs, cysts and oocysts of parasites (Taylor *et al.*, 2016). For identification of *Giardia* cysts and *Cryptosporidium* oocysts, lugol's iodine and modified Ziehl-Neelson staining were performed, respectively.

The eggs, cysts and oocysts of parasites were identified from their morphological characters, using a light optical microscope with a magnification of 10x and 40x.

Simple Sedimentation Technique

About 10 grams of faces and 100 ml of saline solution were taken in a glass cylinder. The mixture was thoroughly stirred to make a uniform suspension of the fecal particles. The suspension was then allowed to pass through a sieve (30-50 meshes to the inch) into another glass cylinder and then allowed to stand for half an hour. The supernatant fluid was carefully poured off and a small amount of sediment was taken out with the help of a medicinal dropper and was placed on a glass slide. A coverslip was placed on it and care was taken to avoid bubble formation between the glass slide and the coverslip. The slide was then placed under a compound microscope and examined with low power objective 10x.

Flotation technique

Flotation procedure was performed using Sheather's Sucrose solution. The fecal pellet was resuspended in 10 ml of Sheather's solution (specific gravity 1.27 g/ml) and mixed thoroughly. The mixture was increased up to the brim of the centrifuge tube and centrifuged for 10 minutes at 4000 rpm. The downward force created by the centrifugal spinning enhanced the buoyancy of the eggs in the viscous solution and drove them to the surface meniscus where they were concentrated and resulted in greater parasite recovery. Examination of a few drops of the fluid from the topmost layer revealed the eggs and oocysts/cysts (Dryden *et al.,* 2005).

Lugol's iodine staining

Direct smear from the sediment of each concentrated fecal sample was prepared on a clean glass slide, diluted with a drop of Lugol's iodine, covered with coverslip and finally examined under light microscope at 40X magnification to observe the *Giardia* cysts (Hendrix, 2002).

Modified Ziehl-Neelson staining

Thin smears were prepared from sediments of concentrated fecal samples and air-dried. The smears were fixed with absolute methanol for 5 minutes, air dried and stained with carbol-fuchsin (0.34% fuchsin and 4% w/v phenol) for 30 minutes. Smears were washed with tap water and decolorized with 1% acid-alcohol (1 ml hydrocloric acid and 99 ml of 96% ethanol) for 2 minutes; washed with tap water and counterstained with 1% methylene blue for another 2 minutes, rinsed again in tap water and air-dried. The stained smears were examined by microscope using oil immersion objective to screen oocysts of *Cryptosporidium* (Tahvildar-Biderouni and Salehi, 2014).

Statistical analysis

The data generated from the questionnaire and parasite identification were recorded in the Statistical Package for the Social Sciences (SPSS 20.0). Descriptive statistics and the Chi-square test were done to determine the significant effects of different explanatory variables on percentage values of parasitism. Significances was determined when $p<.005$. According to the Books named Research Methodology by Kothari (2007) and Business Statistics by Gupta & Gupta (2007).

Results and Discussion

Overall prevalence of GI parasitic infections in calves

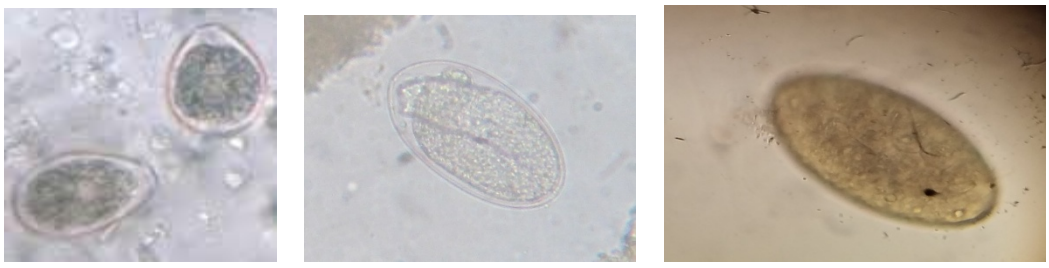
In this study, overall prevalence of gastrointestinal parasitic infections (single/mixed) in calves was 45.54% (n=199/437) in this selected population. The prevalence of helminths

were the snail-borne trematode, namely, *Fasciola* sp. (1.14%), two species of protozoa, namely, *Giardia* sp. (10.3%) and *Cryptosporidium* spp. (7.09%), two species of nematodes, namely, *Toxocara* spp. (19.91%) and *Strongyloides* spp. (4.12%) and one cestode *Moniezia* spp. (1.6%) (Fig. 2). However, mixed infection was found only in case of nematodes (*Toxocara* spp. and *Strongyloides* spp.) with the prevalence of 1.37%.

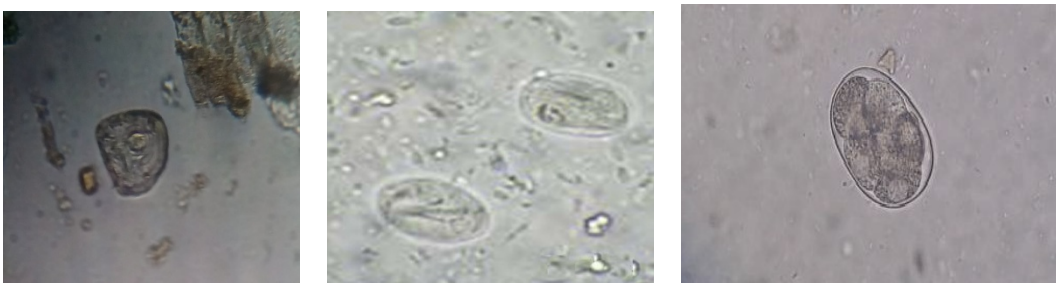
On the other hand, it was observed that the prevalence of *Toxocara spp*. (19.91%) was the highest whereas, *Fasciola spp*. (1.14%) infection was the lowest among the parasitic infections in calves (Table 1). The overall prevalence of GI parasitism was similar to the findings of Karim *et al*. (2019) who reported 45.3% calves were affected with various helminthes in selected area of Sirajganj. On the other hand, prevalence of GI parasitism was lower than the findings of Paul *et al.* (2016) and Aktaruzzaman *et al.* (2013) who reported that 72.65% and 76.9% cattle were infected with various helminths at Sylhet and Sirajgonj, respectively in Bangladesh. Similarly, Bhattacharyya and Ahmed (2005) and Singh *et al.* (2008) recorded 65.2% and 80.0% incidence of gastrointestinal helminthes, respectively in cattle in India. The variation between the present and earlier results might be due to the differences among the geographical locations and climatic conditions of the study areas, feeding, management and genetic variation in host resistance as well as a gradual increase in awareness of farmers about routine deworming in study areas. Similar to this study, calves were mostly infected with *Toxocara* spp. and prevalence of infection might be related to prenatal infection with 3rd larval stage, and poor hygienic condition during post-natal period (Miller *et al*., 2013). However, similar types of parasites as reported in this study were detected by different scientists in different areas with variable rate of infections (Ahmed *et al.,* 2015; Islam *et al.*, 2014; Fayer, 2010; Xiao, 2010). In Bangladesh, most of the calves in rural areas are reared in scavenging or semi scavenging system, where they graze on the fields. This type of practice may favor the parasitic infestations in calves.

Table 1. Overall prevalence of GI parasitic infection in calves

Types of Parasites	Name of Parasites	No. Infected (N=437)	Prevalence (%)
Nematode	*Toxocara spp.*	87	19.91
	Strongyloides spp.	18	4.12
	Mixed (*Toxocara spp. And Strongyloides spp*.)	6	1.37
Trematode	*Fasciola spp.*	5	1.14
Cestode	*Moniezia spp.*	7	1.6
Protozoa	*Giardia spp*.	45	10.3
	Cryptosporidium spp.	31	7.09
Overall		199	45.54



A. Egg of *T. vitulorum* B. Egg of *Strongyloides spp* C. Egg of *Fasciola spp*.



D. Egg of *Moniezia spp.* E. Egg of *Giardia spp.* F. Egg of *Cryptosporidium spp.*

Fig 2: Various eggs of Identified parasite.

Diversity of GI parasitic infection according to study location

Comparative analysis (Table 2) revealed that coastal areas (Kotalipara and Agailjhara) were more vulnerable for gastrointestinal parasite. The prevalence of different GI parasitic infections two study area's varied from 45.78% to 45.28%. The lower parasitic infection (45.28%) was recorded in Agailjhara upazila of Barishal district though infection by different species of parasites in study areas was statistically not significant (Table 2).

Table 2. Diversity of GI parasitism in calves in different study areas

Name of Parasites	**Study area**	
	Kotalipara (%) (N=225)	Agailjhara (%) (N=212)
Toxocara spp.	45 (0.2)	42 (19.81)
Strongyloides spp.	10 (4.44)	8 (3.77)
Mixed (*Toxocara spp. And Strongyloides spp.*)	4 (1.78)	2 (0.94)
Fasciola spp.	2 (0.89%)	3 (1.42)
Moniezia spp.	4 (1.78%)	3 (1.42)
Giardia spp.	24 (10.67)	21 (9.91)
Cryptosporidium spp.	14 (6.22)	17 (8.02)
Total	103 (45.78)	96 (45.28)

Values in the parenthesis indicate the percentage of parasitic disease prevalence

The slight difference in the prevalence of GI parasitic infections might be due to variation in geo-climatic conditions of these areas of study.

Prevalence of GI parasitic infections in relation to age

Age specific prevalence of GI parasitic infections varied significantly ($p<0.05$) among different age groups of calves and the highest infection was recorded in calves of >3 to ≤ 6 months (54.95%) and lowest in calves of ≤ 3 months (38.51%) of age (Table 3).

The prevalence of *Toxocara* spp. infection was the highest in calves of >3 to ≤6 months (28.57%) and the lowest in the calves of >6 to ≤8 months (8.64%). The protozoan infection by *Giardia* sp. (13.58%) and *Cryptosporidium* spp. (7.47%) were the highest in the calves of >6 months to ≤8 months and ≤ 3 months, respectively.

Table 3. Prevalence of GI parasitic infections in calves in relation to Age

Name of Parasites	Age category		
	≤ 3 months (%) (N=174)	>3 to ≤6 months (N=182)	>6 to ≤8 months (N=81)
Toxocara spp.	28 (16.1)	52 (28.57)	7 (8.64)
Strongyloides spp.	8 (4.6)	8 (4.4)	2 (2.47)
Mixed (*Toxocara spp. And Strongyloides spp.*)	2 (1.15)	3 (1.65)	1 (1.23)
Fasciola spp.	0(0.0)	2 (1.09)	3 (3.7)
Moniezia spp.	0(0.0)	5 (2.75)	2 (2.470
Giardia spp.	16 (9.2)	18 (9.89)	11 (13.58)
Cryptosporidium spp.	13 (7.47)	12 (6.59)	6 (7.41)
Total	67 (38.51)	100 (54.95)	31 (41.98)

Values in the parenthesis indicate the percentage of parasitic disease prevalence

Prevalence of snail-borne trematode infection was found to increase with the increase of age and was highest at age of >6 to ≤8 months (3.7%). *Fasciola* sp. was not recorded in calves less than 3 months of age. Susceptibility of calves to *Moniezia* spp. was highest in calves of >3 to ≤6 months (2.75%) and absent in calves under 3 months (Table 3). The findings of the study was similar to Karim *et al.* (2019) who reported the highest infection was recorded in calves of >3 to ≤ 6 months (54.4%) and lowest in calves of ≤ 3 months (36.6%) of age. On the other hand, this result is different with the results by Raza *et al.* (2010) and Samad *et al.* (2004) who reported that these parasites are mostly prevalent in young age. The cause of this high prevalence in young cattle might be due to sudden exposure to grassland containing huge number of eggs of parasites, and possibly due to lack of necessary protective immunity of the calves. *Fasciola spp.* and *Moniezia spp.* were not observed in calves under 3 months of age. This might be the consequences of feeding habit of calves and time requirement for completing the life cycle of these parasites. However, Rahman and Mondal (1983) found heavy infection of *Fasciola spp.* in cattle of 2-3 years of age than in the young cattle.

Sex-wise distribution of GI parasites in calves

In the present study, sex specific prevalence of GI parasitic infection was observed higher in male (49.73%) than in female calves (42.4%) (Table 4). In males, the highest prevalent parasite was *Toxocara* spp. (18.72%) followed by *Giardia* sp. (12.3%), *Cryptosporidium* spp. (9.63%), *Strongyloides* spp. (4.81%), *Fasciola* sp. (1.6%), and *Moniezia* spp. (1.6%).

Table 4. Prevalence of GI parasitic infections in calves of different sexes

Name of Parasites	Sex category	
	Male (N=187)	Female (N=250)
Toxocara spp.	35 (18.72)	52 (20.8)
Strongyloides spp.	9 (4.81)	9 (3.6)
Mixed (*Toxocara spp.* and *Strongyloides spp.*)	2 (1.07)	4 (1.6)
Fasciola spp.	3 (1.6)	2 (0.8)
Moniezia spp.	3 (1.6)	4 (1.6)
Giardia spp.	23 (12.3)	22 (8.8)
Cryptosporidium spp.	18 (9.63)	13 (5.2)
Total	93 (49.73)	106 (42.4)

Values in the parenthesis indicate the percentage of parasitic disease prevalence

In female calves, the highest prevalence was recorded for *Toxocara* spp. (20.8%) and lowest for *Fasciola* sp. (0.8%) (Table 4). Coincidence to this finding, higher prevalence was reported in male animals than in females by some other studies in Bangladesh, Pakistan and Ethiopia (Karim *et al.*, 2019; Paul *et al.*, 2016; Hailu *et al.*, 2011; Ibrahim *et al.*, 2008). On the other hand, higher rate of parasite infection in female animals than in male was also reported (Das *et. al.*, 2010; Islam and Taimur, 2008). However, Siddiki *et al*. (2010) observed that both male and female Red Chittagong Cattle breed and crossbred animals were equally susceptible to parasitic infections. The higher percentage of infection in the male cannot be explained exactly, but it might be due to the neglected attitude of the farmers toward the management of male animals since many of the farms target milk production thereby focusing more on the health of females. In addition, higher feed and water intake might make the male individual more susceptible to any infection (Paul *et al.*, 2016).

Variation in GI parasitism according to breed

In this finding, the prevalence of parasitic infection was more common in cross breed calves (47.39%) than in indigenous calves (37.63%). But the difference was not so higher (Table 5).

Table 5. Prevalence of GI parasitic infections in calves of different Breed

Name of Parasites	Breed	
	Indigenous (N=93)	Crossbred (N=346)
Toxocara spp.	14 (15.05)	73 (21.1)
Strongyloides spp.	4 (4.3)	14 (4.05)
Mixed (*Toxocara spp. And Strongyloides spp.*)	1 (1.08)	5 (1.45)
Fasciola spp.	1 (1.08)	4 (1.16)
Moniezia spp.	2 (2.15)	5 (1.45)
Giardia spp.	6 (6.45)	39 (11.27)
Cryptosporidium spp.	7 (7.53)	24 (6.94)
Total	35 (37.63)	164 (47.39)

Values in the parenthesis indicate the percentage of parasitic disease prevalence

In both breeds, the highest prevalence of GI parasitic infection was recorded for *Toxocara* spp. (21.1, 15.05%) and the lowest for *Fasciola* sp. (1.08%, 1.45%). Similar findings had been described by Gadre (2007) and Karim *et al.*, (2019) who reported that the infection rates with GI parasitic infections in cross-bred cattle were relatively higher than in local dairy animals. This study revealed that the infection rate with *Toxocara* spp. was comparatively higher in cross-breed (21.1%) than in the indigenous calves (15.05%) which are almost similar to the earlier report by Roy et al. (2010).

Holstein Frisian and Jersey are usually adapted in countries having relatively low temperature with minimal chances of parasitic exposure. The parasitic ecology and reproduction are closely related to an optimal environmental condition, which is not normally common in these countries. But, Bangladesh is a tropical country with hot-humid environment which is favorable for parasite reproduction. For this reason, crossbred animals in Bangladesh become readily infected by parasites and different predisposing factors including managing of these animals in parasitic load environment further worsen the condition.

Effect of health status on GI parasitic infections

Health status of calves had a great effect on the occurrence of GI parasitism and infections were higher in poor health conditioned calves (76.32%) than that of normal conditioned (39.06%). The poor health calves show the highest prevalence in case of *Toxocara* spp. (40.79%) followed by *Giardia* sp. (11.82%), *Strongyloides* spp. (7.89%), *Fasciola* sp. (5.26%), *Cryptosporidium* spp. (5.26%), and *Moniezia* spp. (2.63%). In healthy calves, the highest prevalence was found for *Toxocara* spp. (15.51%) and the lowest for *Fasciola* sp. (0.28%) (Table 6).

This result consent with the result reported by Karim *et al.* (2019), Mustafa et al. (2022), Ilyas *et al.* (2016) and Alim *et al.* (2012). Malnourished animals are more susceptible to any infection as they are immune compromised. It appears that malnutrition in animals increases their susceptibility to the parasitic infection (Biswas *et al.*, 2014).

Table 6. Health status related prevalence of GI parasitism in calves

Name of Parasites	Health Status	
	Normal (N=361)	Poor (N=76)
Toxocara spp.	56 (15.51)	31 (40.79)
Strongyloides spp.	12 (3.32)	6 (7.89)
Mixed (*Toxocara spp. And Strongyloides spp*.)	4 (1.1)	2 (2.63)
Fasciola spp.	1 (0.28)	4 (5.26)
Moniezia spp.	5 (1.39)	2 (2.63)
Giardia spp.	36 (9.97)	9 (11.82)
Cryptosporidium spp.	27 (7.48)	4 (5.26)
Total	141 (39.06)	58 (76.32)

Values in the parenthesis indicate the percentage of parasitic disease prevalence

It may also happen due to the fact that the poor and weak animals, as a result of any other causes, are not able to resist the challenge of parasitic infection and become easily infected.

Relationship between fecal consistency and GI parasitic infections in calves

Calves with loose feces had more parasitic infection (56.52%) than the calves with formed (41.88%) and soft (45.2%) feces, however the difference was not significant (Table 7). Among the parasites, *Toxocara spp*. was more common in calves with each type of feces (loose = 20.29%, formed=20.94% and soft=18.64%) whereas *Fasciola* sp. and *Moniezia* spp. were found in calves with soft (0.56% and 2.82%, respectively) and loose feces (4.35% and 2.9%, respectively). Loose feces are a common clinical finding in many parasitic as well as bacterial and viral diseases that make animal immune-compromised and vulnerable. For this reason, calves with loose feces might have more parasitic infection than others.

Table 7. Prevalence of GI parasitic infections in calves based on fecal consistency

Name of Parasites	Fecal consistency		
	Formed (%) (N=191)	Soft (%) (N=177)	Loose (%) (N=69)
Toxocara spp.	40 (20.94)	33 (18.64)	14 (20.29)
Strongyloides spp.	8 (4.19)	8 (4.52)	2 (2.9)
Mixed (*Toxocara spp. And Strongyloides spp*.)	2 (1.05)	3 (1.7)	1 (1.45)

Fasciola spp.	1 (0.52)	1 (0.56)	3 (4.35)
Moniezia spp.	0 (0.0)	5 (2.82)	2 (2.9)
Giardia spp.	17 (8.9)	17 (9.6)	11 (15.94)
Cryptosporidium spp.	12 (6.28)	13 (7.34)	6 (8.7)
Total	80 (41.88)	80 (45.2)	39 (56.52)

Conclusions

GI parasitic infections are common among calves in Kotalipara upazila of Gopalganj district and Agailjhara of Barishal district. The study was performed to determine the prevalence of gastrointestinal parasitic infections in calves considering age, sex, breed and nutritional status at BAPARD surrounding coastal areas. The highest prevalence was found for *Toxocara spp.* and the lowest for *Fasciola* sp. It was also found that age, sex and health status had significant effects on the prevalence of GI parasitism in calves. Parasitic diseases play great effects on health and production of animals. The explored information of this study will give an overall idea about the distribution of gastrointestinal parasitic infections among the study areas. It will also provide some epidemiological ideas in the occurrence of such diseases in cattle. Economic losses due to mortality and morbidity in calves per year in Bangladesh may be determined by further studies. However, this study will make the way to take further extensive study related to these infections which will help to take necessary preventive and control measures against them.

References

Afazuddin, M. 1985. General incidence and therapeutic measures of parasitic diseases in cattle of Savar Military Dairy Farm. MSc Thesis, Department of Medicine, Bangladesh Agricultural University, Mymensingh.

Ahmed, R., P. K. Biswas, M. Barua, M. A. Alim, K. Islam and M. Z. Islam. 2015. Prevalence of gastrointestinal parasitism of cattle in Banskhali upazilla, Chittagong, Bangladesh. *J. Adv. Vet. Anim. Res.* 2(4): 484-488.

Akanda, M. R., M. M. I. Hasan, S. A. Belal and A. C. Roy. 2014. A survey on prevalence of gastrointestinal parasitic infection in cattle of Sylhet division in Bangladesh. *American J. Phyto. Clin. Therap.*2: 855–860.

Aktaruzzaman, M., S. A. Rony, M. A. Islam, M. G. Yasin and A. K. M. A. Rahman. 2013. Concurrent infection and seasonal distribution of gastrointestinal parasites in cross-bred cattle of Sirajganj district in Bangladesh. *Vet. World.* 6(10): 720-724.

Alim, M. A., S. Das, K. Roy, S. Sikder, Mohiuddin, M. Masuduzzaman and M. A. Hossain. 2012. Prevalence of gastrointestinal parasites in cattle of Chittagong division, Bangladesh. *Wayamba J. Animal Sci.* 4: 1-8.

Baset M. A., M. M. Rahman, M. S. Islam, A Ara, A. S. M. Kabir. 2003. Beef cattle production in Bangladesh-A Review. *Online Journal of Biological Sciences*. 3(1): 8-25.

Begum M. A. A., M. M. Hossain, M. Khan, M. M. Rahman and S. M. E. Rahman. 2007. Cattle fattening practices of selected farmers in Panchagarh district. *Bang. J. Anim. Sci*., 36:62-72.

Bhattacharyya, D. K. and K. Ahmed. 2005. Prevalence of helminthic infection in cattle and buffaloes. *Indian Vet. J.* 82: 900-901.

Biswas, H., A. R. Dey, N. Begum and P. M. Das. 2014. Epidemiological aspects of gastrointestinal parasites in buffaloes in Bhola, Bangladesh. *Indian J Anim Sci.* 84: 245–250.

Charlier, J., F. V. Velde, M. Van Der Voort, J. V. Meensel, L. Lauwers, V. Cauberghe, J. Vercruysse and E. Claerebout. 2015. Econohealth: Placing helminth infections of livestock in an economic and social context. *Vet. Parasitol.* 212: 62–67.

Chavhan, P. B., L. A. Khan, P. A. Raut, D. K. Maske, S. Rahman, K. S. Podchalwar, and M. F. Siddiqui. 2008. Prevalence of nematode parasites of ruminants at Nagpur. *Vet. World.* 1: 140.

Das, S., A. K. F. H. Bhuiyan, N. Begum, M. A. Habib and T. Arefin. 2010. Fertility and parasitic infestation of Red Chittagong cattle. *Bangladesh Vet.* 27(2): 74-81.

Dryden, M. W., P. A. Payne, R. Ridley and V. Smith. 20115. Comparison of common fecal flotation techniques for the recovery of parasite eggs and oocysts.*Vet. Therapeut.* 6 (1): 15-28.

Fayer, R., M. Santin and D. Macarisin. 2010. *Cryptosporidium ubiquitum* n. sp. in animals and humans. *Vet. Parasitol.* 172: 23-32.

Gadre, S.K. and H. Harada. 2007. Surface water pollution in three urban territories of Nepal, India, and Bangladesh. *Environ. Manage.* 28: 483-496.

Gupta S. P. and M. P. Gupta. 2007. Measures of Variations. Business Statistics .New edition, New Delhi,125-171 pp.

Gunathilaka, N., D.Niroshana, D. Amarasinghe and L. Udayanga. 2018. Prevalence of gastrointestinal parasitic infections and assessment of deworming program among cattle and buffaloes in gampaha district, Sri Lanka. *BioMed Res. Int.* https://doi.org/10.1155/2018/3048373.

Hailu, D., A. Cherenet, Y. Moti and T. Tadele. 2011. Gastrointestinal helminth infections in small-scale dairy cattle farms of jimma town, Ethiopia. *Ethiop. J. Sci. Technol.* 2(1): 31-37.

Hendawy, S. H. M. 2018. Immunity to gastrointestinal nematodes in ruminants: effector cell mechanisms and cytokines. *J. Parasit. Dis*. 42: 471-482

Hendrix, C. M. 2002. Laboratory procedures for veterinary technicians. Mosby, Philadelphia.

Hossain, M. J., M. Amin, M. Mostofa, M. Sharif and S. M. A. Khalid. 2004. Efficacy of levanid against natural gastrointestinal nematodiasis and paramphistomiasis in sheep. *Bangladesh Vet. J.* 21 (2): 70-73.

Ibrahim, M. M., M. A. A. Ghamdi and M. S. A. Gahmdi. 2008. Helminths Community of Veterinary Importance of Livestock in Relation to Some Ecological and Biological Factors. *Turkiye Parazitol Derg.* 32: 42-47.

Ilyas, N., M. M. Hossain, M. J. U. Bhuyan and M. M. H. Khan. 2016. Prevalence of Gastro-intestinal Nematodes Infection of Cattle in Bangladesh. *American J. Phyto. Clin. Therap.* 4(3): 091-097.

Islam, M. R., M. G. Yasin, M. A. Al Noman, N. Begum, M. M. H. Mondal. 2014. Prevalence of gastrointestinal parasites in cattle at Vangura upazila in Pabna district of Bangladesh. *Int. J. Nat. Soc. Sci.* 1: 45-52.

Islam, K. B. M. S. and M. J. F. A. Taimur. 2008. Helminthic and protozoan internal parasitic infections in free ranging small ruminants of Bangladesh. *Slov. Vet. Res.* 45: 67-72.

Jabber, M. and D. A. G. Green. 1983. The status and potential of livestock within the context of agricultural development policy in Bangladesh. The University of Wales. Aberystwyth, United Kingdom. 113 P.

Karim M. R., Sumon S. M. M. R., Soad S. H.,. Siddiki S. H. M. F, Dey A. R.and Ehsan M. A. 2019. Prevalence and Factors Affecting the Parasitic Infections in Calves at Selected Areas of Bangladesh. *Ann. Bangladesh Agric.* 23(2): 1-13.

Kothari C. R. 2007. Processing and Analysis of Data. Research Methodology , 2nd edition, 122-152 pp

Miller, R. S., M. L. Farnsworth and J. L. Malmberg. 2013. Diseases at the livestock-wildlife interface: status, challenges, and opportunities in the United States. *Prev. Vet. Med.*110: 119-132.

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

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

Mustafa M. M. H., M. R. Islam, M. M. 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.

Paul, A., P. C. Baishnab, H. Kobir, S. Akhter, T. J. Chowdhury, B. Jha and M. M. Rahman. 2016. Status of internal parasitism of cattle at Sylhet Government Dairy Farm, Bangladesh. *Int J Nat Sci*. 6(2): 54-34.

Pinilla, J. C., P. Florez, M. T. Sierra, E. Morales, R. Sierra, M. C. Vasquez and D. Ortiz. 2018. Point prevalence of gastrointestinal parasites in double purpose cattle of Rio de Oro and Aguachica municipalities, Cesar state, Colombia. *Vet Parasitol Reg Stud Reports.* 12: 26-30.

Pinilla León, J. C., N. U. Delgado and A. A. Florez. 2019. Prevalence of gastrointestinal parasites in cattle and sheep in three municipalities in the Colombian Northeastern Mountain. *Vet. World.* 12(1): 48-54.

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

Rahman, M. F. and Z. Ahmed. 1991. Final report of "Pilot project for the control of parasitic disease of animals in Bangladesh", Bangladesh Livestock Research Institute, Dhaka.

Rahman, M. H. and M. M. H. Mondol. 1983. Helminth parasites of cattle (*Bosindicus*) in Bangladesh. *Indian J. Parasitol.* 7(2): 173-174.

Raza, A. M., S. Murtaza, H. A. Bachaya, A. Qayyum and M. A. Zaman. 2010. Point prevalence of *Toxocara vitulorum* in Large Ruminants Slaughtered at Multan Abattoir. *Pak Vet J.* 30: 242-244.

Roy, M. M. Alam, A. K. M. A. Rahman, M. Shahiduzzaman, M. S. Parvez and E. H. Chowdhury. 2010. Prevalence of cryptosporidiosis in crossbred calves in two selected areas of Bangladesh. *Bangladesh J. Vet. Med.*12: 185-190.

Samad, M. A., K. M. M. Hossain, M. A. Islam and S. Saha. 2004. Concurrent infection of gastro-intestinal parasites and bacteria associated with diarrhea in calves. *Bang. J. Vet. Med.* 2(1): 49-54.

Sardar, S. A., M. A. Ehsan, A. K. M. M. Anower, M. M. Rahman and M. A. Islam. 2006. Incidence of liver flukes and gastro-intestinal parasites in cattle. *Bang. J. Vet. Med.* 4 (1): 39-42.

Siddiki, A. Z., M.B. Uddin, M. B. Hasan, M. F. Hossain, M. M. Rahman, B. C. Das, M. S. Sarkerand M. A. Hossain. 2010. Coproscopic and haematological approaches to determine the prevalence of helminthiasis and protozoan diseases of Red Chittagong Cattle (RCC) breed in Bangladesh. *Pak. Vet. J.* 30(1): 1-6.

Singh A., Gangwar A. K., Shinde N. K., Srivastava S. 2008. Gastrointestinal parasitism in bovines of Faizabad. *J. Vet. Parasitol.* 22 (1): 31-33.

Tahvildar-Biderouni, F. and N. Salehi. 2014. Detection of *Cryptosporidium* infection by modified ziehl-neelsen and PCR methods in children with diarrheal samples in pediatric hospitals in Tehran. *Gastroenterol Hepatol Bed Bench*. 7(2): 125-30.

Taylor, M. A., R. L. Coop, and R. L. Wall. 2016. Veterinary Parasitology: 4th ed. Blackwell publishing, Oxford.

Thrusfield, M. 2007. Veterinary epidemiology. 3rd Edition, Blackwell science, Oxford, UK.
Xiao, L. 2010. Molecular epidemiology of cryptosporidiosis: an update. *Exp Parasitol.* 124(1): 80-89.