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Prevalence and Risk Factors Associated with Gastrointestinal Parasites in Cattle at Bhaluka Upazila, Mymensingh

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ABSTRACT

Gastrointestinal (GI) parasitism is one of the major constraints to profitable cattle production in tropical and subtropical regions. This study was conducted in Bhaluka Upazila, with an aim to assess the prevalence and risk factors associated with gastrointestinal parasitism in cattle. A total of 110 fecal samples were collected randomly from cattle and examined using simple sedimentation techniques under the microscope. The results revealed 104 samples were positive which indicated an overall prevalence of 94.54%. Three protozoan species, namely, *Balantidium* spp*., Eimeria* spp., and *Giardia* spp. were detected among the study samples with a prevalence rate of 15.45%, 23.64%, and 1.81%, respectively. Moreover, *Paramphistomum* spp. (39.09%) was more prevalent than other helminths such as *Fasciola* spp. (25.45%), *Trichuris* spp. (10.00%), *Dictyocaulus* spp. (1.81%) and *Strongyloides* spp. (1.81%). Moreover, the highest prevalence was observed in trematodes (64.55%), followed by protozoa (40.91%), nematodes (14.55%), and cestodes (2.73%) respectively. Among the samples, a higher prevalence was observed among the calves (100.00%), as opposed to young individuals (93.75%) and adults (18.18%) in the study population. Parasitic infection was more prevalent in the indigenous breed than crossbreed. In addition to this, the infection rate in females was higher (70.90%) than in males (92.31%). The findings provide an epidemiological forecast on the prevalence of gastrointestinal parasitism in cattle, aiding clinicians in diagnosing and preventing GI parasites in cattle.

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Introduction

In tropical and subtropical regions, livestock farming is a major sector contributing significantly to agriculture and providing animal protein, milk, beef, income, jobs, farm energy, and manure worldwide including Bangladesh (Bisimwa et al., 2018). In 2022–2023, the livestock sector contributed 1.85% of GDP, with a growth rate of 3.23%, and provides 20% employment directly and 50% indirectly for the entire population of the country (BBS, 2023). Among the livestock sector, the cattle population in Bangladesh is approximately 24.85 million. (DLS 2023). Rural smallholders and landless farmers conduct approximately 90% of livestock farming to generate their income (Ilyas et al., 2016). 80% of Bangladesh's rural farmers rear Indigenous cattle (Ahmed et al., 2015). In Bangladesh, domesticated ruminants are susceptible to GIP infection, which may lead to one or more harmful effects and result in economic losses for the livestock sector.(Islam et al., 2014). Gastrointestinal parasitism negatively impacts the health and production of cattle globally including in Bangladesh (Sarker et al., 2021). In addition to affecting the health of cattle, intestinal parasites can also cause weight loss, digestive problems, prolonged emaciation, and impaired reproductive and productive capacity (Aktaruzzaman et al., 2013). Asian Development Bank reported that the loss of animal productivity due to parasite diseases was 50% in Bangladesh (ADB, 1984).

The grazing animals such as cattle, buffalo, sheep, and goats are constantly exposed to parasites, leading to constant re-infection in a chain reaction (Akhter et al., 2022). Bangladesh has high rates of parasitism because of its low-lying terrain, abundant rainfall, and humid climate conditions that make cattle more vulnerable to GIPs (Khatun et al., 2021). According to findings, the prevalence of gastrointestinal parasites (GIPs) among cattle in Bangladesh is between 72.0% and 84.8% and in India, a neighboring country, it ranges from 61.1% to 81.8% (Sayeed et al., 2024). In addition to impairing digestion, gastrointestinal parasites can interfere with the absorption of minerals, especially calcium and phosphorus (Islam et al., 2014). In dairy cows, "GIP infections decrease the amount of milk produced to between 1.2 and 2.2 liters per cow per day (Aktaruzzaman et al., 2013). Infections also negatively affect carcass quality and reproductive performance including calving rate and calf mortality. The report found that 50% of calves up to 1 year of age died due to gastrointestinal parasitism in Bangladesh (Hossain et al. 2013). Gastrointestinal parasitism causes significant losses, but often goes unnoticed because infected animals only show minor signs of illness. (Nath et al., 2016). GIPs in animals are influenced by several risk factors, including parasite type, host species, age, sex, physical condition, animal breed, and worm population intensity (Mamun et al., 2020). Ruminants can be hosts to various parasitic worms, such as *Trichuris* sp. and *Oesophagostomum* sp. in the colon, and *Trichostrongylus* sp., *Cooperia* sp., *Nematodirus* sp., *Bunostomum* sp., *Strongyloides s*p., *Moniezia* sp., Eimeria sp., and *Cryptosporidium* sp. in the small intestine. *Paramphistomum* sp. resides in the rumen, while *Haemonchus* sp., *Ostertagia* sp., and *Trichostrongylus* sp. can be found in the abomasum (Kabir et al., 2018). According to findings, at least two-thirds of Bangladesh's cattle population is sub-clinically infested with parasitic helminth parasites (Aktaruzzaman et al., 2013).Recently several epidemiological researches have been conducted on gastrointestinal parasites of cattle in different areas of Bangladesh (Sarker et al. 2021; Islam et al., 2015; Kabir et al. 2018;). However, very few researches have been conducted to investigate the prevalence of GIT parasites in the Bhaluka upazila of Mymensingh district. Despite the lack of available data in the study area, GIPs is considered as a major constraint in cattle production. Hence, the study was conducted to determine the prevalence and identify the risk factors associated with gastrointestinal parasitic infections in cattle at Bahluka Upazila of the Mymensingh district in Bangladesh.

Materials and methods

Study location

The study was conducted in several areas of Bhaluka upazila located at Mymensingh district (Figure 1) with a period of two months (October and November, 2023). During these periods, a total of 110 cattle was randomly selected from those areas. The cattle were of varying ages, where calves were less than 1 year, young were 1-3 years, and adults were more than 3 years of age. The age of the cattle was determined based on the information provided by the owners and through dentition.

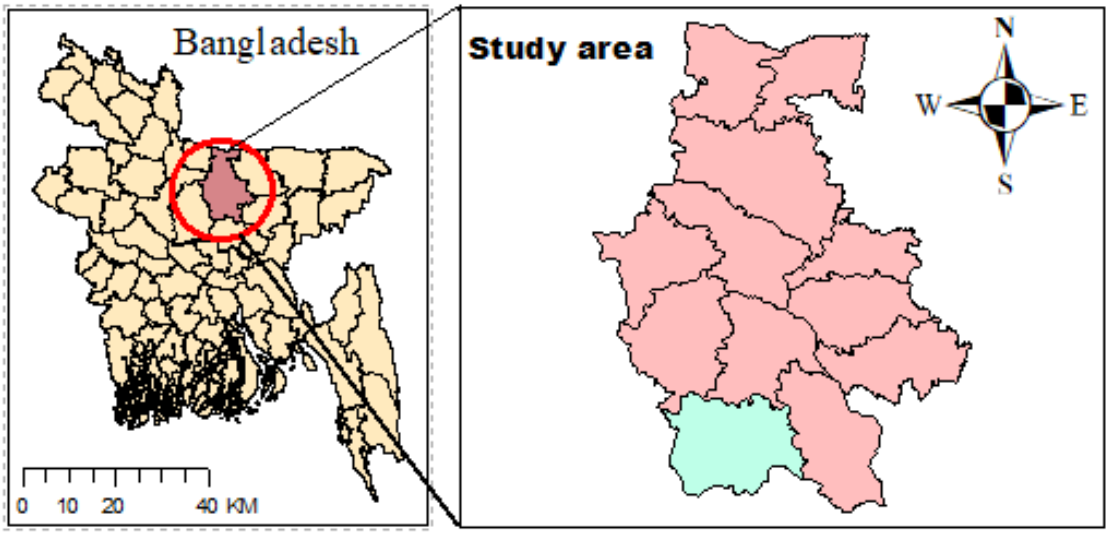

Figure 1: Location of Study area

Study design

All the Data regarding the age, sex, breed, and deworming history of the animal were collected directly from the owners by interviewing them through a structured questionnaire. Additionally, the body condition scoring was determined by physical observation during the sample collection.

Collection of fecal samples

After completing the questionnaire, approximately 25-30 gms of the fecal specimens from each animal were collected from the freshly excreted feces and placed into a plastic zipper bag. Then the bag, containing the fecal sample, was filled with 10% formalin and refrigerated at 4◦C temperature for further analysis. Labeling of the sample was strictly followed to prevent misinterpretation during sample collection.

Examination of fecal samples

All the samples were examined by simple sedimentation technique, where about 5-10 gms of feces was placed in a beaker through proper homogenization and added sufficient water to mix properly. After passing through a sieve, the suspension was let to settle for 30 minutes into another beaker. The supernatant was removed very carefully and added sufficient water. These steps were repeated three to five times until the supernatant was clear. Finally, the supernatant fluid was gently drained off and a small amount of sediment was scooped out with the use of a medicinal dropper and placed on a glass slide. A coverslip was placed on the slide, and care was taken to avoid bubble formation between the glass slide and the coverslip. According to

Hendrix et al. (2006), at least four smears were prepared from each sample to identify the morphological features of eggs, cysts, and oocysts of GIT parasites. After that, the slide was examined with a 10x low-power objective using a compound microscope.

Statistical Analysis

Excel (Office 365) was used to import, store, and code the raw data as needed. Microsoft Excel and STATA version 12 (Stata Corp., College Station, Texas) were used for the data analysis. For the chi-square test, proportions were used to represent descriptive statistics together with a P-value, while the data were considered significant at the time ≤0.05.

Results

Overall prevalence of GIT parasitic infections in cattle

A total of 110 cattle was examined through coprological examination where 104 cattle were found infected with one or more species of GIT parasites indicating an overall prevalence of 94.55% at Bhaluka upazila, Mymensingh of Bangladesh. Among the identified parasites, there were 6 genera of helminths and 3 genera of protozoa (Figure 2). Among the identified helminths, the two snail-borne trematodes were found, namely, *Fasciola gigantica* (25.45%), *Paramphistomum* spp. (39.09%); while three nematodes found were *Trichurus* spp. (10.00%) and *Strongyloides* spp. (1.81%) and *Dictyocaulus* sp. (1.81%); and the only cestodes found were *Moniezia* spp. (3.64%). On contrary, three protozoa were found, namely *B. coli* (15.45%), *Eimeria* spp. (23.64%), and *Giardia* spp. (1.81%). The findings of the study pointed out that the prevalence of *Paramphistomum* spp. (39.09%) was the highest, while *Dictyocaulus* sp., *Strongyloides* spp., and *Giardia* spp. infections were the lowest (1.81%), which is documented in Table 1. Moreover, the highest prevalence was observed in trematodes (64.55%), followed by protozoa (40.91%), nematodes (14.55%), and cestodes (2.73%), respectively.

Table 1. Overall prevalence of GIT parasitic infection in cattle

Types of Parasites	Species name	No. of infected animals (N=110)	Species-wise Prevalence (%)	Group-wise Prevalence (%)
Trematode	*Fasciola gigantica*	28	25.45	64.55
	Paramphistomum spp.	43	39.09	
Nematode	*Trichuris* spp.	11	10.00	14.55
	Dictyocalus spp.	2	1.81	
	Strongyloides spp.	2	1.81	
Cestode	*Moniezia* spp.	3	2.73	2.73
Protozoa	*Balantidium coli*	17	15.45	40.91
	Eimeria spp.	26	23.64	
	Giardia spp.	2	1.81	

Table 2. Prevalence of GIT parasite among the categories of the considered risk factor

Variables	Level	No. of Samples observed	No. of Samples Infected (%)	P-value
Breed	Local	68	66 (97.06%)	**0.803**
	Cross	42	38 (90.48%)	
Age	Calf (<1 year)	20	20 (100.00%)	**0.979**
	Young (1-3Years)	64	60 (93.75%)	
	Adult (> 3years)	26	24 (92.31%)	
Sex	Male	30	26 (86.67%)	**0.705**
	Female	80	78 (97.50%)	
BCS	Poor Moderate	54	54 (100%)	**0.832**
	Moderate	44	41 (93.18%)	
	Healthy	12	9 (75.00%)	
Deworming	Yes	56	50 (89.29%)	**0.678**
history	No	54	54 (100.00%)	

Prevalence of GIT parasitic infections in relation to different risk factor

During sampling, several risk factors including breed, age, sex, body condition score (BCS), and deworming history were noted thorough observation and these data were documented in Table 2. Overall, infection rates were consistently high, with no statistically significant associations observed for any variable, as indicated by P-values greater than 0.05. Regarding breed, local breeds exhibited a slightly higher infection rate (97.06%) than crossbreeds (90.48%). Moreover, age-wise, calves (<1 year) were most affected, with a 100% infection rate, followed by young animals (1–3 years) at 93.75% and adults (>3 years) at 92.31%, though these differences also lacked significance (P = 0.979). Females showed a higher infection rate (97.50%) compared to males (86.67%). In addition to this, BCS results indicated that animals with poor/moderate condition had the highest infection rate (100%), followed by moderate (93.18%) and healthy animals (75.00%). Lastly, deworming history revealed that animals without deworming had a higher infection rate (100%) compared to dewormed animals (89.29%). Though there are discernible patterns in the data overall, the lack of statistical significance indicates the possibility that these factors do not significantly impact infection rates in this study population.

Prevalence of mixed GIT parasitic infection

Examined faecal samples were infected by one or more species of parasites, shown in Figure 3. Among the 104 positive samples, 75 were infected with a single species of parasites (72.12%) and the rest 29 were infected with multiple parasites. In case of the mixed infection, 26 were infected with two species of parasites (25.00%) and only 3 samples were contaminated with more than two species of parasites (2.88%).

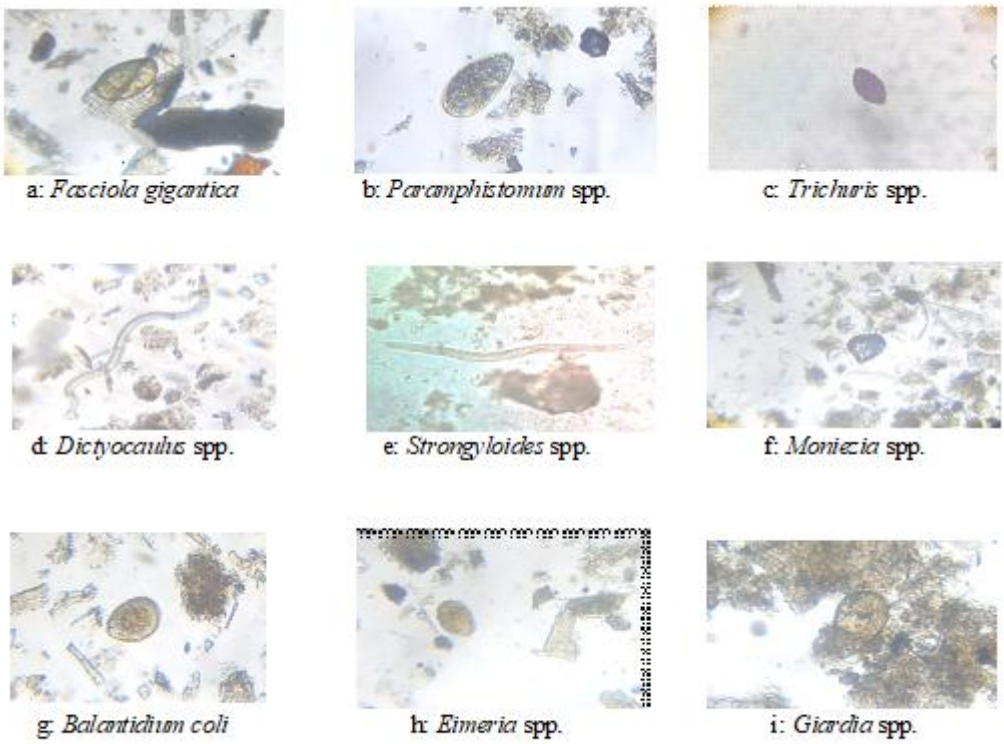

Figure 2. Identification of GI Parasites

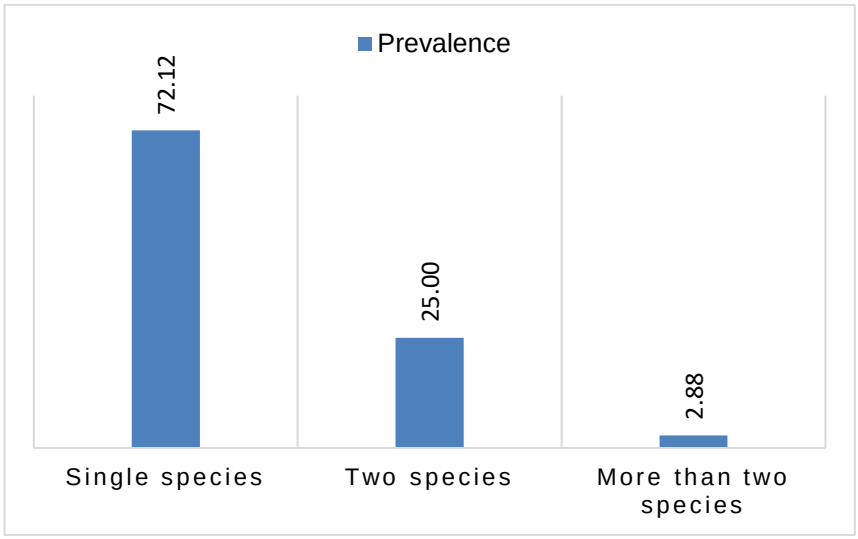

Figure 3. Prevalence of mixed infection

Discussion

The results revealed 104 samples out of 110 were positive with gastrointestinal parasites which indicated an overall prevalence of 94.54%. The overall prevalence of GI parasitism was greater than that of the studies conducted by Islam et al. (2015), Paul et al. (2016), and Aktaruzzaman et al. (2013), which found that different helminth infections affected 78.84%, 72.65%, and 76.90% of cattle in Pabna, Sylhet, and Sirajganj, Bangladesh, respectively. On other hand, according to Bhattacharyya and Ahmed (2005), the prevalence of gastrointestinal helminths in Indian cattle was 68.68%. These variations in the findings might be due to geographical and climatic factors, the size of the sample and selection of the sample, the breed, age, and gender of the subjects, dietary plans, stress levels, the availability of intermediate hosts, methods of farming and animal care, and other managemental factors. In rural areas of Bangladesh, most cattle are raised in a scavenging or semi-scavenging manner, allowing them to graze in fields. Such a method of rearing could potentially increase the likelihood of parasitic infestations in the cattle (Karim et al., 2019).

The age of the cattle in this study influenced the occurrence of gastrointestinal parasite infection, which was shown in Table 2. The highest prevalence was observed among the calves (100.00%), as opposed to young individuals (93.75%) and adults (92.31%) in the study population. These findings are supported by Aktaruzzaman et al. (2013), who reported that parasitic infection was more common in young cattle due to lower immune response. In this study, females (97.50%) were found to have a higher prevalence of GIT parasite infection than males (86.67%). In this regard, the finding of this study is nearly similar in line with the result of Ahmed et al. (2015), who found higher infection in female cattle in Bangladesh. On the other hand, Khan et al. (2023) found more male cattle infection than female in Pakistan. These variations may be due to keeping more female cows for their daily needs such as milk and other dairy products was observed during sample collection. However, lower immune system of female during pregnancy or due to hormonal differences females are more prone to become infected with gastrointestinal parasites (Dabasa et al., 2017; Verma et al., 2018). Prevalence of gastrointestinal parasitic infections based on deworming was also calculated where 100.00% and 89.29% cattle were infected in case of non- dewormed and regular dewormed cattle, respectively in different areas of Bhaluka upazila. Our finding resembles with the result of Gunathilaka et al. (2018) who found higher infection in cows lacking a history of deworming practices. Untreated animals may have high prevalence rates because they are not receiving medication, and farmers may not be aware that anti-helminthic medications can be used to control gastrointestinal parasites in animals (Khan et al., 2023). The health status of cattle had an effect on the prevalence of gastrointestinal parasitic infections (GIPs), which showed higher in cattle with 'poor' (100.00%) body condition compared to 'moderate' (93.18%) and 'healthy' (75.00%) conditions. This result is consistent with the findings reported by Khan et al. (2023) and Ilyas et al. (2016). Malnourished animals are more susceptible to infections due to compromised immune systems resulting from inadequate nutrition. Moreover, parasitic infection was found higher in indigenous breed (local) cattle (97.06%) than crossbreed cattle (90.48%). Variations in the prevalence of parasite infection may be attributed to geographical variance, sample size, rearing system, husbandry practices, and genetic resistance (Thanasuwan et al., 2021).

Conclusions

GIPs are considered a significant threat in the livestock sector with less noticeable symptoms. The present study disclosed that gastrointestinal parasites such as trematode, nematodes, cestode, and intestinal protozoa infections in cattle are prevalent throughout the study area with prevalence of 64.55%, 14.55%, 2.73%, and 40.91%, respectively. Heavy intensity (39.09%) was found only in the case of *Paramphistomum* spp. among all four categories. This investigation also gives us a scenario of the current status of the GI parasites of Bhaluka Upazila region.

Competing interest

The authors declare that there is no conflict of interests regarding the publication of this article.

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