A Clinical report on the prevalence of gastrointestinal parasite on buffalo in Chattogram division.

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List of Abbreviations

Abbreviation	Elaboration
<	less than
≤	Lesser or equal
≥	Greater or equal
%	Percentage
º	Degree Celsius
GI	Gastrointestinal

Abstract

Parasite is one of the major obstacles to the way of maximum production in dairy industry of all over the world. This investigation was conducted to measure the prevalence of GI parasites of buffalo in different areas of Chattogram Division, Bangladesh and its associated risk factors (Age, Sex, Deworming history and Geographical location). Total 100 fecal samples were collected from January 2023 to July 2023. A well-structured questionnaire was used to collect the information relevant to the objectives of the study. Then these samples were examined through direct smear, floatation and sedimentation technique to pick up the positive samples. The overall prevalence of GI parasites was found 41% where about 9 species of parasite were found in these tests, having 4 nematodes, 1 trematode, 3 protozoa and mixed infections. The highest amount of egg identified was of *Toxocara vitulorum*, nearly 46.34%. Boalkhali and Kabirhat was the more prevalent area among the selected areas, where *Eimeria* cyst and *B. coli* cyst were only noticed in Companiganj. The calves tested more vulnerable (46.14%) to the helminths infection than young (40%) and adult (40.53%). Also, the males have higher prevalence than the female animals. Male buffaloes were 1.42 times more prone to GI parasitic infection than the female buffaloes. Besides, the non-dewormed animals also seems to be more susceptible to infection compared to dewormed animals. Further work can be done to confirm molecular identification of the helminth species and also the economic effect of parasitic infection in buffalo.

Keywords: Buffalo, gastro-intestinal parasites, fecal sample, prevalence, nematode.

Chapter-1: Introduction

Bangladesh is an agricultural country where about 70% of people depend on agriculture either directly or indirectly. Livestock is a significant part of agriculture, which contributes to 1.47% of GDP. Bangladesh has one of the greatest livestock population densities in the world, with 145 large ruminants per square kilometer (Amin et al., 2015). According to DLS annual report 2020, there are 4122.44 lakh cattle overall, which is 96.81 lakh higher than the previous year. The government of Bangladesh acknowledged livestock as an important element of the Poverty Reduction Strategy (DLS, 2014). The buffalo (*Bubalus bubalis*) is a valuable multipurpose animal in Bangladesh that is used for milk, manure, hide, and draft in addition to providing a reliable source of protein (Ghaffar et al., 1991). The Food and Agriculture Organization (FAO) referred to buffalo as "an asset undervalued" due to its benefits.

Most often, buffalo are reared by small farmers with no more than two hectares of land. (Mudgal and Sharma, 1992). There are currently 14.93 lakh buffalo in Bangladesh, and this number is growing daily. More people become interested in rearing buffalo as they can be raised in Bangladesh's available coastal areas, which cannot be used for cultivation or the rearing of other animals. In addition, buffalo may eat coarse wheat straw and other low-quality fibrous fodder, such as waterlogged grass. In rural areas, buffaloes are frequently used for draft and pulling purposes, and also used for land preparation for cultivation, like plowing and laddering. These are the reasons the buffaloes were designated as the living tractor of the East (Cockrill, 1968). Buffalo has also become popular among farmers due to their low maintenance requirements, better disease resistance, high milk fat content (7%), high-quality, nutritious meat, and several initiatives by the government.

Diseases are a barrier to achieving the optimum yield and can potentially result in animal death. Like all other livestock, buffalo are susceptible to serious disease-causing organisms named parasites. (Green and Jabber, 1983). It impairs production, hinders reproduction, and even kills calves. Additionally, the cost of treating and preventing these parasites raises the farm's production costs. Buffalos are host to a variety of parasite species, including ectoparasites, and endoparasites (which include hemoparasites and

gastro-intestinal parasites). Gastrointestinal parasitism is a significant global concern. Numerous parasites hide in the gastrointestinal tract of buffalo, which can result in both clinical and subclinical parasitism. Some of the main risk factors for parasitism are grazing behavior, nutritional status, climate, water source, and the quantity of infectious larvae and eggs in the environment (Blood et al., 1994)

To create a suitable prevention and control procedure which is well-established in developed countries it is crucial to identify the common parasites present in the area as well as the epidemiological trends of the parasitism. However, it is unfortunate that in this instance, developing countries lag much behind the developed nations.

Therefore, the purpose of this study was to determine the prevalence of buffalo parasites in different areas of the Chattogram District and to assess how prevalent they are in the context of current husbandry techniques. There has been relatively little research on buffalo parasites in the geographic area where this study was conducted; furthermore, the research that has been conducted has been insignificant. Therefore, the objectives of this investigation were to detect the prevalence and the associated risk factors of the common gastrointestinal parasites found in the buffaloes of Boalkhali, Kabirhat and Companiganj of Chattogram, Bangladesh by-

- Determining the prevalence of gastrointestinal parasites commonly found in buffaloes.
- Investigating the risk factors associated with the prevalence of these parasites.

Chapter-2: Materials and methods

2.1 Study area and Study period

The study was carried out in 3 areas of Chattogram division, Boalkhali, Kabirhat and Companigonj over a 6 months' period (from January to July, 2023). The geographic coordinates of the Chattogram division are 22.3569° N, 91.7832° E. The study area was chosen based on the abundance of buffalo. **(Figure 1)**

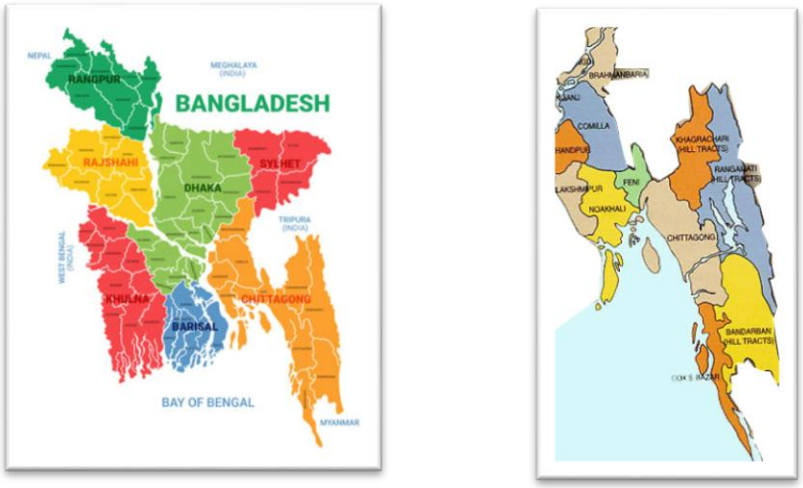

Figure 1: Study Area

2.2 Sample size

A purposive sampling method was used to collect a total of 100 fecal samples of buffalo. Entire buffalo samples were collected from the intensive farms of Boalkhali, Kabirhat and Companigonj upazila of Chattogram division.

2.3 Data collection

The data were collected using a pre-made questionnaire that was relevant to the goal of the study. The age, sex, nutritional state, deworming history, water supply, disease status, and other management practices of the animals were all determined by in-person interviews and on-the-spot data computing.

2.4 Sample collection, preservation, and examination

After completing the questionnaire, fecal samples were collected in a disposable specimen container directly from rectum. Feces weighing between 5-10g were taken from every animal. After that, the samples were preserved for further analysis in a 10% formalin solution at a temperature of 4-5º C.

Routine tests (direct smear, floatation and sedimentation) were used to evaluate the parasite eggs, and oocysts which were identified based on the morphology (Soulsby, 1982). Nematodes eggs were identified using the direct smear and floatation technique of fecal sample examination, where saturated sugar solution was used as floatation fluid. On the other head, trematodes eggs were identified by the direct smear and sedimentation technique.

First, a little amount of feces is smeared on a clean glass slide using the direct smear technique. A few drops of water were then added and a cover slip was placed over the smear. After that, it was examined under a microscope. In floatation technique, the fecal sample was placed in a test tube and filled with flotation fluid. The convex meniscus was then covered with a cover slip. After15 minutes, the cover slip was taken off and put on a glass slide for microscopic inspection. The sedimentation technique was performed by allowing the fecal suspension to remain for about 15 minutes before removing the supernatant and placing a drop of sediment on a glass slide with a cover slip and examining it under the microscope.

2.5 Statistical analyses

For additional analysis, the gathered data were processed, arranged, and entered into a Microsoft Excel worksheet. The data were exported to STATA^{TM} 13 (STATA Corporation College Station, Texas) for Chi-Square test. The result was considered significant at the level of 5% (p-Value= 0.05).

2.6 Ethical consideration

The study was carried out with ethical principles in mind, and each respondent provided their oral agreement after being informed of the study's goal.

Chapter- 3: Results

3.1 Overall prevalence of gastrointestinal parasite in buffalo

A total of 100 fecal samples were collected and analyzed, with 41 of them testing positive for gastrointestinal helminthes. 4 nematode genera, 2 protozoa genera, and 1 trematode genera and mixed infections was detected in this study. Nematodes have the highest infection rates among them, followed by trematode and protozoa. The prevalence rates of protozoa, trematodes, nematodes and mixed infection were 14.63%, 12.20%, 53.66%, and 19.51%, respectively **(Figure 2).**

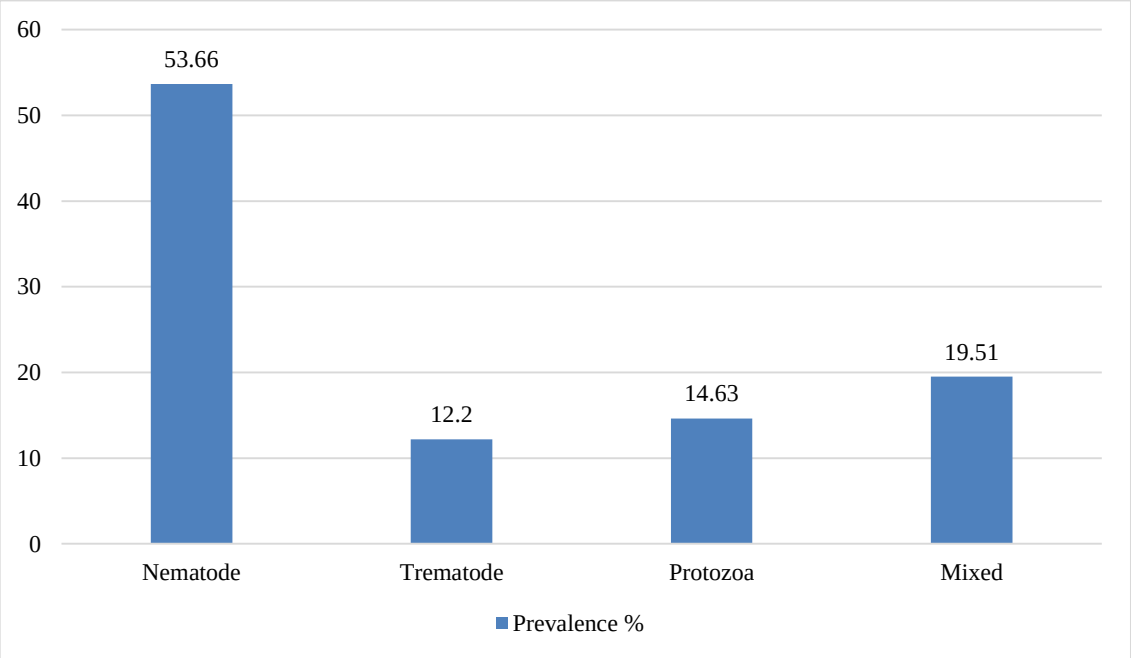

Figure 2: Prevalence of nematode, trematode, protozoa and mixed parasites in buffalo.

Toxocara vitulorum, Oesophagostomum sp, Trichostrongylus sp, and *Trichuris sp.* were the nematodes identified in the sample. *Paramphistomum cervi* was found among all trematode species. Trophozoite and cyst of *B. coli* and cyst of *Eimeria sp* were found as a protozoa species. Also different mixed infections also identified in the sample.

At 46.34% prevalence, *Toxocara vitulorum* was the most common nematode. *Paramphistomum sp* and mixed infections were also the prevalent among the others, with 12.20% and 19.51% frequency, respectively **(Table 1).**

Table 1: Overall prevalence of gastrointestinal parasites in buffalo in Chattogram.

Name of parasites	**No. of animals infected (N=41)**	**Prevalence (%)**
Toxocara vitulorum	19	46.34%
Oesophagostomum sp	1	2.44%
Trichostrongylus sp	1	2.44%
Trichuris sp.	1	2.44%
Paramphistomum sp	5	12.20%
Trophozoite of *Balantidium coli*	3	7.32%
Eimeria cyst	1	2.44%
B. coli cyst	2	4.88%
Mixed	8	19.51%

3.2 Location related prevalence of gastrointestinal parasites in buffalo

Boalkhali was the more prevalent location among all the selected areas of Chattogram. Most of the parasites were found both in Boalkhali and Kabirhat, where *Eimeria* cyst and *B. coli* cyst were only found in Companigonj. The most prevalent *Toxocara vitulorum* was found in Boalkhali (24.44%) and Kabirhat (16%) **(Figure 3).**

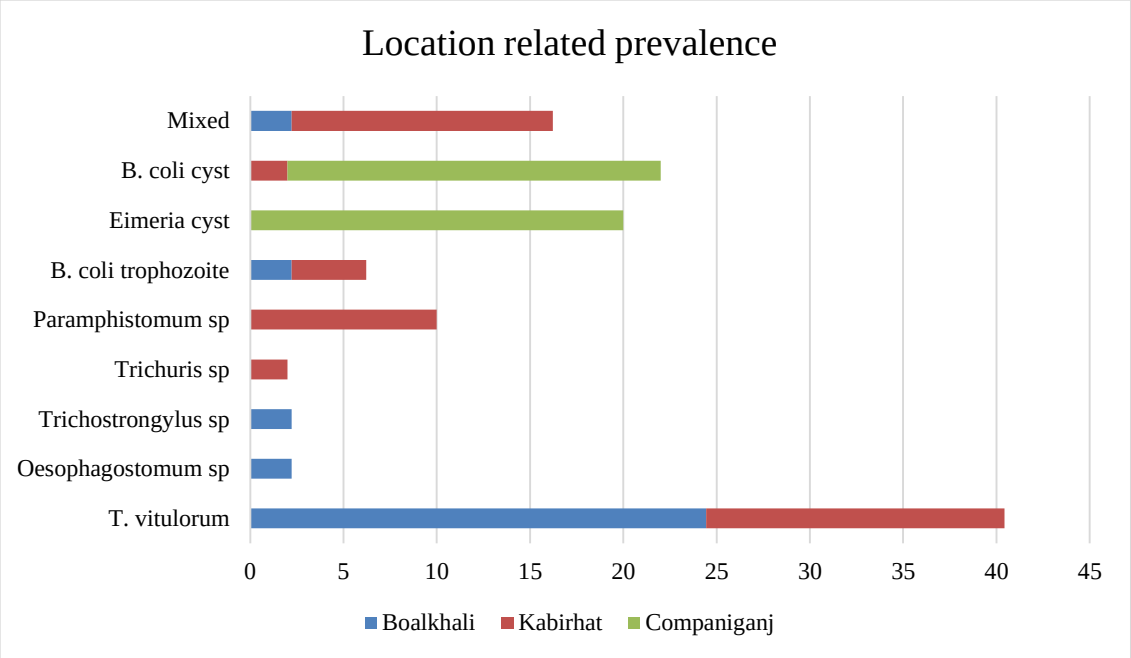

Figure 3: Location related prevalence of gastrointestinal parasites in buffalo.

3.3 Age related prevalence of gastrointestinal parasites in buffalo

The overall frequency of gastrointestinal helminths was greater in young animals compared to calves and adults. *Toxocara vitulorum* had the highest prevalence among youngs at 24%, significantly more than in calves (15.38%) and adults (13.51%). Similarly, other parasites such as *Oesophagostomum sp*, *Eimeria sp*, *Paramphistomum sp*, and *Eimeria cyst* showed distinct infection patterns among the age groups **(Table 2).**

Table 2: Age related prevalence of gastrointestinal parasites in buffalo in Chattogram

Name of parasites	Calves % (N= 13)	Young % (N=50)	Adult % (N=37)	*p*- Value
Toxocara vitulorum	15.38 (2)	24.00 (12)	13.51 (5)	0.439
Oesophagostomum sp	0	2.00 (1)	0	0.603
Trichostrongylus sp	0	2.00 (1)	0	0.603
Trichuris sp.	0	0	2.7 (1)	0.423
Paramphistomum sp	**15.38 (2)**	**0**	**8.11 (3)**	**0.042**
Trophozoite of *Balantidium coli*	0 (0)	4.00 (2)	2.70 (1)	0.746
Eimeria cyst	0	0	2.7 (1)	0.423
B. coli cyst	0	2.00 (1)	2.7 (1)	0.836
Mixed	15.38 (2)	6.00 (3)	8.11 (3)	0.539

3.4 Sex related prevalence of gastro-intestinal parasites in buffalo

The result of the study showed that the male animals were more prone to infection than female. *Toxocara vitulorum* had a prevalence of 25.81% in male animals compared to 15.94% in female animals. Similarly, most of the parasites like Tropozoite and cyst of *Balantidium coli*, *Trichostrongylus sp* had higher infection rates in male animals, whereas *Trichuris sp.*, *Eimeria* cyst and mixed infections were higher in females **(Table 3).**

Table 3: Sex related prevalence of gastro-intestinal parasites in buffalo in Chattogram.

Name of parasites	Male% (N=31)	Female% (N=69)	*p*- Value
Toxocara vitulorum	25.81 (8)	15.94 (11)	0.245
Oesophagostomum sp	3.23 (1)	0.00 (0)	0.134
Trichostrongylus sp	3.23 (1)	0.00 (0)	0.134
Trichuris sp.	0	1.45 (1)	0.501
Paramphistomum sp	3.23 (1)	5.8 (4)	0.585
Trophozoite of *Balantidium coli*	6.45 (2)	1.45 (1)	0.175
Eimeria cyst	0	1.45 (1)	0.501
B. coli cyst	3.23 (1)	1.45 (1)	0.557
Mixed	6.45 (2)	8.70 (6)	0.702

3.5 Deworming related prevalence of gastrointestinal parasites in buffalo

It was shown in this study that *Toxocara vitulorum, Oesophagostomum sp, and Trichostrongylus sp.* were more in non-dewormed animals, whereas all the remaining 6 species of nematode, trematode and protozoa including mixed infections are prone to dewormed animals. *Toxocara vitulorum* had a highest prevalence (24.44%) in non-dewormed animals than dewormed animals (14.55%) **(Table 4).**

Table 4: Deworming related Prevalence of gastro-intestinal parasites in buffalo in Chattogram.

Name of parasites	Dewormed (N=55)	Non dewormed N=45)	*p*-Value
Toxocara vitulorum	14.55 (8)	24.44 (11)	0.209
Oesophagostomum sp	0	2.22 (1)	0.267
Trichostrongylus sp	0	2.22 (1)	0.267
Trichuris sp.	1.82 (1)	0	0.363
Paramphistomum sp	9.09 (5)	0	0.038
Trophozoite of *Balantidium coli*	3.64 (2)	2.22 (1)	0.680
Eimeria cyst	1.82 (1)	0	0.363
B. coli cyst	3.64 (2)	0	0.196
Mixed	12.73 (7)	2.22 (1)	0.054

Chapter 4: Discussion

4.1 Overall prevalence of gastrointestinal parasite in buffalo

The buffaloes' health and productivity are hampered by GI parasitic illness. The purpose of this study was to present the general prevalence of GI parasites and the risk factors that are linked to them in 3 upazilas of Chattogram division. The total prevalence discovered was 41%, lesser than the prevalence (54%), which was documented in Mirsarai, Bangladesh (Nath et al., 2013).

However, (Biswas et al., 2014) showed a comparatively higher frequency of 84.30%. The prevalence reported by (Azam et al., 2002) and (Mamun et al., 1970) were likewise higher than those of the current study, at 61.02% and 64.41%. Differences in animal selection, sample collection, deworming history, health status, and climate could all contribute to the difference.

4.2 Location related prevalence of gastrointestinal parasites in Buffalo

In this study, buffalos from Boalkhali and Kabirhat were more susceptible to the gastrointestinal parasitism than the buffalos of Companigonj. This results partially supports the findings of (Alim et al., 2012); they observed that coastal areas are more vulnerable to the GI parasitism than the other areas. This partial contradiction could be happened because of the limited sample size, fluctuation of the temperature and humidity of the areas or hygienic conditions of the farms.

4.3 Age related prevalence of gastrointestinal parasites in buffalo

Age has an important effect on the prevalence of GI parasites in buffalo. In this current study, younger animals showed a higher susceptibility to parasite infection than older ones. Calves had a higher total prevalence of gastrointestinal helminths (46.14%) than young people (40%) and adults (40.53%). The susceptibility of calves was 1.14 times higher than that of adult buffaloes. This study supports the findings of (Raza et al., 2007) and (Maqbool et al., 2002), which reveals that the prevalence of GI helminths is higher

in young buffaloes than in adults. The results of (Mamun et al., 2011) and (Raza et al., 2007) supports the present study's conclusions.

Nevertheless, the results contradicted the findings of (Alim et al., 1997) and (Biswas et al., 2014), who observed that adults were more susceptible to infection than younger ones. Although the exact source of this variations is unknown, but it can be occur due to the immune status, climatic conditions, and management practices of the animals.

4.4 Sex related prevalence of gastro-intestinal parasites in buffalo

In this current study, male buffaloes were more susceptible to infection than female buffaloes. The overall prevalence of the Male buffalos was 51.63%, where female buffalos was 36.24%. Male buffaloes were 1.42 times more infected than the female ones. According to (Mamun et al., 2011), males were 1.08 times more prone than females to become infected. However, some observed that GI parasites were similarly prevalent in buffaloes of both sexes, such as (Maqbool et al., 2002). On the other hand, it was found by (Alim et al., 2016) and (Alim et al., 2004) that females had a higher prevalence than males. The female buffaloes' physiological condition may be the cause of the contradiction. According to (Lioyd's et al., 1983) findings, female animals with elevated levels of prolactin and progesterone hormone may be more vulnerable to infection.

4.5 Deworming related prevalence of gastrointestinal parasites in buffalo

Higher infection were seen in non-dewormed animals. Dewormed buffaloes were less susceptible to infection than the non-dewormed one. This results supports the findings of (Alim, 1997), (Biswas et al., 2014); they also observed that the incidence of the condition rises with the cessation of anthelmintic medication. This could be because non-dewormed animals' immunity and capacity to withstand sickness are weaker than those of dewormed animals.

Chapter- 5: Conclusion

This study showed the current situation of buffalo GI parasites in Boalkhali, Kabirhat, and Companigonj, with nematodes being the most prevalent parasite. Before protozoa and trematodes, a considerable number of mixed illnesses were discovered after nematodes. Boalkhali and Kabirhat were the most prevalent area than Companigonj. This study also demonstrated that males were more susceptible than females to have GI helminths. Moreover, calves were more prone to infection than adults and young. Additionally, the deworming status of an animal is a significant risk factor because dewormed animals showed to be less susceptible to infection than non-dewormed animals.

This study provides us with an overview of the present situation of the GI parasites in several regions of Chattogram division. A suitable preventative and control measure for gastrointestinal parasite infection can be designed using the data obtained from this study.

Limitations

This study had a relatively small sample size and was only conducted for a short duration of time. Therefore, the current study did not take the effect of climate into account. Furthermore, the molecular identity of the GI parasite species was unknown. Thus, these constraints can be used to focus future study.

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Biography

Myself, Md. Jobair Haque Emon, son of Md Enamul Haque and Salma Akter. I passed my Secondary School Certificate (SSC) examination from Hathazari Parbati Model Govt. High School, Chattogram in 2015 and Higher Secondary Certificate (HSC) examination from Chittagong University College, Chittagong in 2017. Currently I am an Intern Student under the Faculty of Veterinary Medicine in Chattogram Veterinary and Animal Sciences University (CVASU). In future I would like to work as a veterinary practitioner and do research on clinical animal diseases in Bangladesh.