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Assessment of the Prevalence of Gastrointestinal Parasitic Infections of Cattle in Hilly Areas of Bangladesh

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ABSTRACT

A survey of the prevalence of gastrointestinal parasite (GIPs) in scavenging and semi-scavenging cattle was conducted in four hilly areas of Bangladesh during the period from January to December, 2014. Faecal samples from cattle were collected and analyzed using the direct method and formol-ether concentration method. Among 400 samples, 324 samples were found positive with one or more parasites giving an overall prevalence of 81.0%. Amphistomes (*Paramphistomum* spp) was recorded the highest prevalence (60.5%) among the various species of parasites encountered during the study. Other predominant parasites were *Balantidium coli* (16.25%), Gastrointestinal strongyle (11.7%) and *Haemonchus* spp (9.7%). Female cattle (52.2%) was found more infected than male (47.8%). Young (6 to 18 months) were observed more infected compared to adult animals. The distribution of infection by different areas did not show any consistent trend. The high prevalence of parasitic infections in these cattle specifies that the protozoa and helminths concerned are very common in the environment of these areas and therefore, multiple intervention strategies should be implemented to reduce the disease burden. Study surveys suggest, appropriate GIPs control approach to be explored and tried in order to alleviate the problem of worm burden in the present area of study.

***Keywords*:** Gastrointestinal parasites; Cattle; Prevalence; Hilly areas; Bangladesh

1. INTRODUCTION

Bangladesh is an overpopulated agro-based country where per capita income is very low. Cattle, the most prominent domesticated livestock in Bangladesh, represent a valuable asset in both traditional and modern agriculture and almost each and every village home holds cattle. Among all agricultural activities cattle farming occupy large area and play a vital role in the national economy. In Bangladesh, the contribution of agricultural sector to the gross domestic product (GDP) is 21.11%. The livestock sector contributes 2.97% of the GDP while cattle production solely contributes almost 2.1% of the total (Economic index, 2012). Cattle is important for both meat and milk, despite the fact that there could be losses because of different diseases including parasitic infections. The amount of meat, milk and income acquired from domesticated animals is far beneath the national interest because of factors such as death and sickness with associated reduced productivity and expanded the expense of treatment (Hossain et al, 2011).

Parasitic infections are considered to be one of the major constraints that hinder the development of livestock population and also adversely affects the health and productivity of animals. (Hesterberg et al, 2007). Infection of cattle with GIPs is widely reported from all corners of the world and shown to be influenced by the type of cattle management practiced (Raza et al., 2010). The most important predisposing factors for parasitic infections are grazing habits, climate, nutritional deficiency, pasture management, poor immunological status, presence of vector and intermediate host, and the number of infective larvae and eggs in the environment (Edosomwan et al, 2012). The effect of parasitic infections is determined by a combination of factors, of which the varying susceptibility of the host species, the pathogenicity of the parasite species, the host/parasite interaction, and the infective dose are the most important (FAO, 2000). Despite significant losses by gastrointestinal parasitism, the 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). Indirect losses associated with parasitic infections include the reduction in productive potential such as decreased growth rate, weight loss, diarrhea, anorexia, and sometimes anaemia (Swai et al, 2006). In Bangladesh, parasitism has been considered as one of the major constraints of livestock production (Hossain et al, 2011).

Recently a large number of smallholder cattle farms have been established in hilly areas Bangladesh. A literature review of the last decade reveals the paucity of information on the prevalence of gastrointestinal parasites of semi-scavenging and scavenging cattle in hilly areas of Bangladesh. Therefore, in this study, an attempt was made to record the prevalence of gastrointestinal parasites in cattle associated with the influence of age and sex on the prevalence and to correlate between geographical areas and seasonal changes.

2. MATERIALS AND METHODS

Study Area

This cross-sectional study was conducted in four hilly districts of Bangladesh namely Sylhet, Sunamgonj, Khagrachari and Bandarban. The areas are predominately hilly rural and most residents live in those areas are dependent on livestock for their livelihood.

Fig 1. Study areas.

Sample Collection and Identification

Four hundred (400) fecal sample of cattle were taken in the study. Systematic random sampling technique was employed in selecting cattle that were screened at antemortem. For each animal screened, parameters such as the age, sex, and body condition were recorded. Faecal samples were collected per rectum into well-labeled sterile polythene bags and transported in ice packs to the Parasitology Laboratory, Department of Parasitology, Faculty of Veterinary and Animal Science, Sylhet Agricultural University, Bangladesh for gross and microscopic fecal examinations. Samples were examined for parasitic eggs and ova according to the protocols earlier described by Hendrix et al (2006) and Soulsby (1982). Rectal faecal samples obtained from the animals were examined for helminth eggs and coccidian oocysts by the standard McMaster egg counting technique (Soulsby, 1982) using saturated NaCl as the flotation fluid. At least, two smears were prepared from each sample for each test to identify the morphological characteristics of eggs, cyst, oocysts, as described by Hendrix et al, (2006).

Quality control

All laboratory materials such as quality of reagents, sampling equipment, transporting system and microscope were checked by experienced laboratory professionals. To eliminate possible bias, each fecal sample was examined by two times. In presence of unreliable results, the results were checked by the senior associates and it was taken as the final outcome of the examination.

Data analysis

Data management and analyses were performed using Microsoft Excel and STATA version 13. Data were subjected to descriptive statistical analysis using proportion with *P*-value for chi-square test in determining the prevalence rates in the different groups. The level of statistical significance was set at $P<0.05$ and for each statistically significant factor, an odds ratio and 95% confidence interval (CI) were computed by the regression analysis.

Ethical consideration

Approval for this study was obtained from the Department of Parasitology, Faculty of Veterinary and Animal Science, Sylhet Agricultural University, Bangladesh before the implementation of the study. All the samples were collected by the corresponding author (registered veterinarians). Informed written consent was obtained from the owner of the selected cattle.

3. RESULTS

A total of 400 cattle fecal sample from four hilly areas of Bangladesh were included in the study. Among the sample, 191 (47.8%) were males and 209 (52.2%) were females. The mean age of study subjects was 3 years with a minimum and maximum age of 0.6 years and 4.5 years respectively.

Table 1. Types of parasites found in Cattle in Hilly areas of Bangladesh, 2014.

Sl No.	Parasites	Types
1	*Balantidium coli*, *Eimeria* spp	Protozoa
2	Amphistomes (*Paramphistomum* spp), *Fasciola gigantica*	Trematode
3	*Haemonchus* spp, Gastro-intestinal strongyles	Nematode
4	*Moniezia* spp.	Cestode

The overall prevalence of gastrointestinal parasitic (GIPs) infection was 324 (81.0%). Among them, female cattle were 171 (42.7%) and male cattle were 153(38.3%). Higher prevalence of GIPs infection was recorded in females compared with male cattle. Regarding parasitic infection in specific age group, cattle with age group 6 to 18 months was found more infected than 18-36 months and >36 months age groups of study subjects (85.6% vs. 79.1 and 79.6%), correspondingly. But, the variance was not statistically significant (P > 0.05) in the presence of GIPs infection and with sex and also age. In 76 (19%) cattle, GIPs infection was not found (Table 2).

Table 2. Prevalence of GIPs by sex and age groups of Cattle in Hilly areas of Bangladesh, 2014.

Variable		Total no (%)	Gastrointestinal Parasites (GIPs)	
			Positive (%)	Negative (%)
Sex	Male	191 (47.8)	154 (80.6)	37 (19.4)
	Female	209 (52.2)	170 (81.4)	39 (18.6)
Age groups (years)	6 to 18	104 (26)	89 (85.6)	20 (14.4)
	18-36	110 (27.5)	87 (79.1)	23 (10.9)
	> 36	186 (46.5)	148 (79.6)	38 (20.4)
	Total	400	324 (81.0)	76 (18)

Seven intestinal parasite species including five helminths such as *Paramphistomum* spp (Amphistomes), *Fasciola gigantica*, *Haemonchus* sp, Gastrointestinal strongyles, *Moniezia* spp, and two protozoa such as *Balantidium coli* and *Eimeria* spp were identified among collected fecal samples (Table 1). The overall prevalence of helminthic infections was (63.8%). Among the helminthic infections, Amphistomes (60.5%) being the most

predominant, followed by Gastrointestinal strongyles (11.75%) and *Haemonchus* spp (9.7%), while only (2.2%) had *Fasciola gigantica* and (0.8%) had *Moniezia* spp infection. Most of helminth parasites such as *Haemonchus* spp, *Fasciola gigantica* and *Moniezia* spp were higher (61.5%), (71.5%) and (65.7%), respectively in female but there was no statistically significant difference when compared with male cattle (P > 0.05). With regard to protozoal infection, the highest prevalence rate was due to *Balantidium coli* 16.2% and followed by 0.8% *Eimeria* spp. The prevalence rate in *Balantidium coli* was higher in females. However, it was not with statistically significant difference (P > 0.05) (Table 3). Interestingly, *Eimeria* spp infection was only recorded in the male cattle.

Table 3. Distribution of GIPs according to species in hilly areas of Bangladesh, 2014.

Types of parasites	Name of Parasites	Males	Females	Both sex	P-value
Protozoa	*Balantidium coli*	32 (49.3%)	33 (50.7%)	65 (16.25%)	P > 0.05
	Eimeria sp.	3 (100.0%)	0 (0.0%)	3 (0.75%)	P > 0.05
Helminths	Amphistomes	117 (48.3%)	125 (41.7%)	242 (60.5%)	P > 0.05
	Fasciola gigantica	2 (28.5%)	7 (71.5%)	9 (2.25%)	P > 0.05
	Haemonchus sp.	15 (38.4%)	24 (61.5%)	39 (9.7%)	P > 0.05
	Gastrointestinal strongyles	22 (46.8%)	25 (53.2%)	47 (11.75%)	P > 0.05
	Moniezia spp.	1 (33.3%)	2 (65.7%)	3 (0.75%)	P > 0.05
Total		153 (47.3%)	171 (52.7%)	324 (81.0%)	P > 0.05

(P < 0.05) indicates statistically significant difference.

The prevalence of parasitic infections was observed in statistically significant difference among cattle (P = 0.023). The prevalence was higher in Sunamgonj (86.25%). Amphistomes infections were also observed in the highest prevalence (72.5%) in Sunamgonj with statistically significant difference (P = 0.043), followed by 22.5% *Balantidium coli*. Amphistomes infection was found in high prevalence rate in Sylhet (63.0%).

Similarly compared with others, Sylhet had high parasite prevalence rate (7.0%) in Liver fluke infection. *Balantidium coli* and Gastrointestinal strongyles were the highest prevalent parasitic infection in Bandarban with (20.0%) and (15.8%), respectively. Statistically, there was no significant difference in the presence of GIPs infections and cattle of different areas except Gastrointestinal strongyles and Amphistomes infection (Table 4).

Table 4. Distribution of GIPs in hilly areas of Bangladesh, 2014.

Types of Parasites		Sylhet		Sunamgong		Khagrachari		Bandarban		P-value
		No	%	No	%	No	%	No	%	
Total positive		86	86	69	86.25	73	73.0	96	80.0	
Protozoa	*Balantidium coli*	14	14.0	18	22.5	9	9.0	24	20.0	P > 0.05
	Eimeria sp.	2	2.0	0		1	1.0	0	0	
Helminths	Amphistome	63	63.0	58	72.5	53	53.0	68	56.7	P < 0.05
	Gastrointestinal strongyles	12	12.0	12	15.0	5	5.0	19	15.8	
	Fasciola gigatica	7	7.0	0	0	1	1.0	1	0.8	
	Moniezia spp.	2	3.0	0	0	0	0	1	0.8	
	Haemonchus spp	12	12.0	09	11.25	18	18.0	8	6.7	
None		11	16.0	24	30.0	27	27.0	14	11.7	
Single Infection		63	63.0	44	55.0	60	60.0	71	59.1	
Double Infection		21	21.0	19	23.7	12	12.0	24	20.0	
Multiple Infection		2	2.0	6	7.5	1	1.0	1	0.8	

(P < 0.05) indicates statistically significant difference.

In this study, single infection (59.5%) was most prevalent, followed by double infections (19.0%) and multiple infections (2.5%). In case of double infection, the combination of Amphistomes and *Haemonchus* spp were the most dominant, accounting for (9.75%) of the total study samples. Among the study areas, double and multiple infections were found higher in Sunamgonj (Table 4).

4. DISCUSSION

It is known that the transmission of gastrointestinal parasites relies on upon the on the incidence of infected cattle, intermediate hosts, poor sanitation and principally, the husbandry and managemental practices of cattle. This study attempted to show the overall status for the prevalence of gastrointestinal parasitic infection in cattle among the hilly districts. The overall prevalence of gastrointestinal parasite was found (81.0%) and it was steady with the previous study in various areas of Bangladesh which was conducted by Islam et al. (2014) at Vangura,

Pabna; Ahmed et al. (2015) at Banskhali, Chittagong; and Saifuzzaman (1996) at Chandina, Comilla. Similar high prevalence gastrointestinal parasites among cattle have also been reported by in a number of neighbour countries (Singh et al. 2009, Saravanan et al, 2009). On the other hand, the prevalence of parasitic infection found in this study is much higher than the findings of Sardar et al. (2006) at Trishal, Mymensingh. The variations in the finding with the earlier reports might be due to the difference in the sample size, selection of samples, breed, period and place of study, climatic conditions, managemental factors and the availability of intermediate hosts.

Age is important to risk factor for the prevalence of intestinal parasitic infection. In this study relatively highly prevalent parasitic infection was observed in young cattle. This might be due to adult are comparatively more resistant than the young to be infected with intestinal parasite. In contrast, other study revealed that the prevalence was found to be significantly high in young with lower age in compared to adult (Anwar, 2008; Rahman et al, 1996). This could be because of the fact that as the cattle becomes older the exposure to different risk factors for GI parasite infection rises.

Results also showed that helminth infections were more common compared with protozoan infections. Amphistome accounted the highest prevalence of intestinal parasite (60.5%). This finding showed higher Amphistome infection in compared to other GI parasites. These outcomes is supported by the previous studies which were conducted in different areas of Bangladesh where *Paramphistomum cervi* was the highest prevalent (Ahmed et al, 2015; Islam et al, 2014; Rahman et al, 1996) and other countries (Singh et al, 2009, Bokkakoty et al, 1977). In agreement with the global data, Amphistome infections were highest among the GI parasites in the current study. The hot and humid weather and availability of intermediate host (water snail) favored for the presence of the parasite in this study area. *Haemonchus* spp was found to be the second most prevalent (9.7%) in this study. This prevalence was lower compared with another study by Islam et al, (2014) and another country by Saravanan et al, (2009). *Moniezia* spp, Gastrointestinal strongyles and liver fluke infection rate were found to be lower than the previous studies (Ahmed et al, 2015; Samad et al, 2004). Gastrointestinal parasitic infection prevalence rate varies in the different areas. This was attributed to the uneven distribution of the cattle breeds amongst the different zones.

As for protozoal infection, the overall prevalence was found lower than other studies. In agreement with other studies in Bangladesh, the prevalence of *Balantidium coli* (16.2%) and *Eimeria* spp (0.75%) was very low. Islam et al, (2014) reported the prevalence of *Balantidium coli* and *Eimeria* spp were 41.76% and 6.47% respectively. But, this was not steady with the study which was directed in Udaipur district, India (Swarnakar et al, 2015).

In this study, single, double and multiple infections (59.5%, 19.0% and 2.5%) were found correspondingly. High prevalence rate of single infection had observed than other studies (Islam et al, 2014; Ahmed et al 2015; Anwar, 2008). Amphistomes and *Haemonchus* infection were found high as double infections, which were also recorded by Alim et al, (2012).

5. CONCLUSION

The agroecological and geo-climatic conditions of Bangladesh are highly favorable for the growth with multiplication of gastrointestinal parasites. The study was done to determine

the prevalence of gastrointestinal parasitic infections in both crossbred and indigenous cattle considering age, sex and season in hilly areas. The explored information of this study will give an overall idea about the distribution of gastrointestinal parasitic infections among the study areas. However, poor management, unavailability of drugs, lack of awareness of the farmers also enhance the high incidence of the infection. Avoiding low-lying pastures have also significantly importance for controlling fluke infections. Periodic anthelmintic treatment should be given to get the maximum benefits from cattle. However, this is an initial study; further study should be required to identify the epidemiological risks factors of the disease and to prevent the infections of animals and maximizing the cattle production in Bangladesh.

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AUTHOR CONTRIBUTIONS

The design of the study, field experiments, data analysis and writing of the manuscript was performed by Tilak Chandra Nath while Nabila Ilyas and Shyamal Kumar Chowdhury help in the collection of samples and laboratory examination. The laboratory examination was guided by Jamal Uddin Bhuiyan and Kazi Mehetazul Islam.

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