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Research article

Study on the prevalence of gastro intestinal parasites of economic importance in cattle in Bangladesh

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ABSTRACT

The study was conducted to find out the prevalence of parasites of economic importance in cattle in the hilly and the coastal areas of Bangladesh. A total of 1200 fecal samples were collected from the study areas in three consecutive seasons (winter, summer and rainy). Fecal samples were examined by routine coproscopic method. The effects of topography, season, age, breed, gender on prevalence of gastrointestinal parasites were analyzed in this study. The overall prevalence of gastrointestinal parasitic infections was recorded as 35.33% and 36.16% in hilly areas and coastal areas respectively. A significantly ($P<0.05$) higher prevalence of parasitic infections was found in the summer (43.00%) followed by rainy (32.50%) and winter (31.75%). The prevalence of parasitic infection was significantly ($P<0.05$) higher in crossbred cattle (36.99%) than the indigenous cattle (35.58%), while -female had higher prevalence (36.03%) than the male animals (34.95%). A wide range of parasites were recorded during the study periods. Among them the prevalence of *Paramphistomum* (24.42%) were more common followed by *Strongyles* (4.25%), *Strongyloides* (3.08%), *Toxocara* (2.83%), *Fasciola* (2.50%), cyst of *Balantidium coli* (1.90%), *Trichuris* (1.20%), Coccidia (0.50%), *Schistosoma* (0.25%) and *Moniezia* (0.16%).According to percent (%) of positive cases identified, it was found that *Paramphistomum* spp was the most prevalent parasites in both the hilly and the coastal area and its extent of infection vary significantly ($P<0.05$) due to variation in topography. Similar significant ($P<0.05$) topographical variation was also found in the infection with *Fasciola* spp, *Toxocara* spp and strongyles parasites.

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INTRODUCTION

Livestock play an important role in the national economy of Bangladesh. It also generates 13% of foreign currency and provides 20% fulltime employment and 50% partial employment of rural population (Alam, 1993). The rural poor, including the functional landless, many of whom rear livestock as a main livelihood option. The farm animals are susceptible to different infetious diseases like gastro intestinal (GI) parasitic infections and is one of the major constraints in the development of livestock industry (Akter *et al.*, 2011; Khin, 2007; Edosomwan *et al.*, 2012). Economic losses by gastrointestinal parasitism could be in a variety of forms: they can cause loss through lowering the fertility, reducing work capacity, involuntary culling, decreasing food intake, decreasing production and treatment cost etc. (Sardar et al., 2006; Ashutosa *et al.*, 2011; lebbie *et al.*, 1994; Chavhan *et al.*, 2008 and Silvestre *et al.*, 2000). Again, there are a number of potential risk factors that

influence the prevalence of gastrointestinal helminths such as age, sex, climatic conditions, husbandry and management practices (Miller *et al.*, 1998; Khan, *et al.*, 2010; Alim, 2011 and Sardar *et al.*, 2006). In different areas of Bangladesh, several investigation on gastrointestinal parasitic diseases (Mondal, *et al.*, 2000; Samad *et al.*, 2004; Sardar *et al.*, 2006 ; Siddiki *et al.*, 2010 and Alim , 2011) had been conducted but in Chittagong region, especially in the hilly and the coastal areas data were very limited (Alim, 2011; Siddiki *et al.*, 2010). Therefore, the present study was designed to study the prevalence of parasites in crossbred and local cattle and to formulate suitable protocols/steps for the prevention and control of economic important parasitic diseases of cattle in the hilly and the coastal areas of Bangladesh.

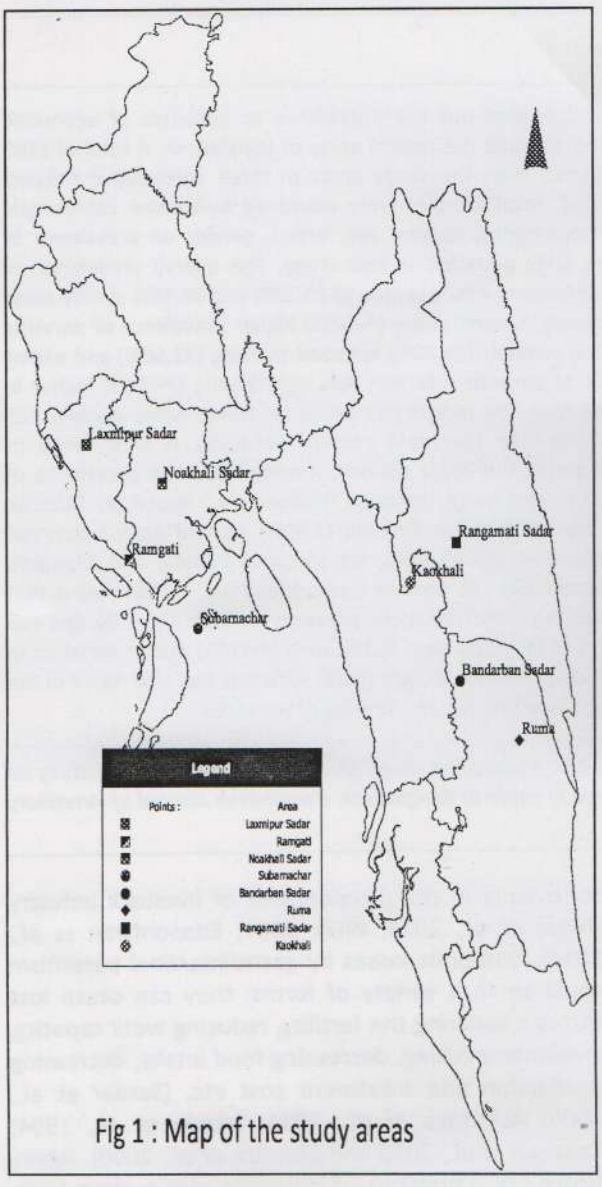

Fig 1 : Map of the study areas

MATERIALS AND METHODS

Description of study areas

The study was conducted in the hilly and the coastal areas of 4 different districts under Chittagong division. The hilly study areas were comprised of Bandarban sadar and Ruma Upazilla of Bandarban district; Rangamati sadar and Kaokhali upzilla of Rangamati district. On the other hand, Noakhali sadar Upazilla and Suburnochar upazilla of Noakhali district and Laxmipur sadar and Ramgoti upazilla, of Laxmipur district were selected to represent the coastal areas (Fig 1).

Study periods

The study was conducted for a period of 12 months. The project field works started in October, 2012 and ended in September, 2013 and the total period was divided into viz., i) winter (November to February), ii) summer (March to June) and iii) rainy (July to October).

Study animals

Holstein Friesian (HF) crossbred and local cattle (Red Chittagong /Indigenous/Non-descript) were selected as target animals. To determine the age and breed susceptibility of different parasites, cattle were classified into three sub groups. For HF crossbred cattle, it was calf (<1 year), Young (>1 - < 2.5 year) and Adult (>2.5years) and for local cattle, it was almost same but age limit differs for Young (>1-3.5 years) and Adult cattle (>3.5 years) (Sastrt *et al.*, 2005).

Target sampling

Every month 25 feces samples were collected from each selected areas at random basis. A questionnaire was used to record information like owner's name and address, animal identification (ID), breed, age, sex, pregnancy status, housing history and farmer's status etc. Farmer's status were categorized into viz i) Poor ii) Moderate and iii) ultra poor. Housing history was treated as floor type and categorized into paka and mati floor.

Sample collection and preservation and examination

Faeces (approximately 5-10gm) were collected directly from the rectum of an animal and the samples were stored in clean plastic containers containing 10 % formalin. The container was kept in a cool box and transferred to the Parasitology laboratory, CVASU and the samples were refrigerated at 4^0C temperature until the examination was done. Three different types of classical qualitative tests, namely Direct smear, Floatation and Sedimentation techniques were used to examine the fecal samples (Hendrix 2006). Sugar Salt solution/ZnSO4 was used as flotation fluid.

Statistical Analysis

The obtained information was imported, stored and coded accordingly using Microsoft Excel -2007 to STATA/IC-11.0 for analysis. Prevalence was determined by total number of infected animal/ total number of animal examined. The association between the independent factors such as breed, age, sex, season, housing history (floor category), farmer's economic condition and the prevalence of the gastrointestinal parasites were evaluated using the Chi-square test (χ^2). In all the analysis, confidence level was held at 95%, and P<, 0.05, P, <0.01 and P<0.001 set for significance.

RESULTS

Prevalence of gastrointestinal parasites

In the hilly area the prevalence was recorded higher in crossbred cattle than the local cattle but in the coastal area it was almost similar. In both the hilly and the coastal areas the prevalence of parasites was higher in adult animal than the young animals or calves (Table 1). In the hilly area, the prevalence was observed higher in the winter season but in the coastal area the prevalence was found higher in the summer season. In both areas the prevalence was found little higher in animals reared in paka floor than the animals reared in mati floor. In the hilly area the prevalence was found higher in male animals than the female animals. But in the coastal areas it was vice versa.

Table 1: Prevalence of gastrointestinal parasitic infections in hilly and coastal areas

Factors	Factor level	Hilly areas			Hilly areas		
		No. of samples examined	No. of samples positive	Percentage	No. of samples examined	No. of samples positive	Percentage
Season	Summer	200	65	32.50***	200	107	53.50***
	Rainy	200	72	36.00	200	58	29.00
	Winter	200	75	37.50*	200	52	26.00*
Age	Calf	168	59	35.11	166	44	26.50
	Young	236	81	34.32	187	75	40.01
	Adult	196	72	36.73	247	98	39.67
Breed	Cross	71	27	38.02	75	27	36.00
	Local	529	185	34.97	525	190	36.19
Sex	Male	164	62	37.80	145	46	31.72
	Female	436	150	34.40	455	171	37.58
Farmers	Moderate	416	145	34.85	399	121	30.32
economic	Poor	177	63	35.59*	200	95	47.50*
condition	Ultra poor	7	4	57.14	1	1	100.00
Floor type	Paka	332	118	35.54	288	107	37.15
	Mati	268	94	35.07	312	110	35.25

Significance at P<0.05; * Significance at P< 0.001*

Prevalence of gastrointestinal parasites in different study areas

The overall prevalence of gastrointestinal parasitic infections (either single or mixed infections) was 35.75%. The prevalence of GI parasite was found higher in Bandarban area (39.00%) and lower in Rangamati area (31.67%). According to percent (%) of positive cases identified, it was found that *Paramphistomum* spp was the most prevalent parasites in both the hilly and the coastal area and its extent of infection vary significantly (P<0.05) due to variation in topography (Table 2). Similar significant (P<0.05) topographical variation was also found in the infection with *Fasciola* spp, *Toxocara* spp, strongyles parasites. The lowest parasitic infections were recorded in the case of Moniezia (0.16%) and *Schistosoma* spp (0.25%). However, a little higher prevalence was recorded in Toxocara spp, and *Strongyloides* spp infections than *Trichuris* and *Balantidium* coli infections in study population.

Table 2: Prevalence of gastrointestinal parasites by parasite species in different study areas

Factors	Area											
	Hilly area								Coastal area		Total	
	Bandarban		Rangamati		Total		Noakhali		Lakshmipur			
	No. of samples examined	No. of samples positive	No. of samples examined	No. of samples positive	No. of samples examined	No. of samples positive	No. of samples examined	No. of samples positive	No. of samples examined	No. of samples positive	No. of samples examined	No. of samples positive
Fasciola spp	300	16 (5.33)	300	5 (1.67)	600	21 (3.50)**	300	3 (1.00)	300	6 (2.00)	600	9 (1.50)**
Paramphistomum spp	300	63 (21.00)	300	57 (19.00)	600	120 (20.00)**	300	78 (26.00)	300	95 (31.67)	600	173 (28.83)**
Toxocara spp	300	9 (3.00)	300	16 (5.33)	600	25 (4.16)*	300	3 (1.00)	300	6 (2.00)	600	9 (1.50)*
Trichuris spp	300	4 (1.33)	300	5 (1.67)	600	9 (1.50)	300	3 (1.00)	300	2 (0.67)	600	5 (0.83)
Strongyloides spp	300	12 (4.00)	300	13 (4.33)	600	25 (4.16)	300	9 (3.00)	300	3 (1.00)	600	12 (2.00)
Cyst of B. coli	300	2 (0.67)	300	10 (3.33)	600	12 (2.00)	300	6 (2.00)	300	5 (1.67)	600	11 (1.83)
Moniezia spp	300	0 (0.00)	300	1 (0.33)	600	1 (0.16)	300	1 (0.33)	300	0 (0.00)	600	1 (0.16)
Oocyst of Eimeria spp	300	4 (1.33)	300	2 (0.67)	600	6 (1.00)	300	0 (0.00)	300	0 (0.00)	600	0 (0.00)
Strongyles parasite	300	12 (4.00)	300	23 (7.67)	600	35 (5.83)**	300	11 (3.67)	300	5 (1.67)	600	16 (2.67)**
Schistosoma spp	300	1 (0.33)	300	0 (0.00)	600	1 (0.16)	300	2 (0.67)	300	0 (0.00)	600	2 (0.33)

**Significance at P< 0.05, **Significance at P<0.01*

Association of different categorical variables with GI parasitic diseases

During this investigation, the effects of different epidemiological factors in the prevalence of parasitic infections in different study areas were determined. No significant differences in the prevalence of parasitic infections in the selected hilly and the coastal areas were observed (Table 3). The prevalence of parasitic infections was significantly (P< 0.05) higher in the summer season (43.00%) followed by the rainy (32.50%) and the winter season (31.75%). The prevalence of helminth parasite was significantly (P<0.05) higher in cattle of poor (41.91%) and ultra poor family (62.50%) than cattle of moderate family (32.63%). Prevalence of GI parasitic infection was significantly (P<0.05) higher in cross bred cattle in comparison with local cattle.

Table 3: Association of different categorical variables with positive GI parasitic infections

Variables	Categories (Sample size)	No. of Parasite positive (%)
Area	Rangamati (300)	95 (31.67%)
	Bandarban (300)	117 (39.00 %)
	Noakhali (300)	108 (36.00 %)
	Laxmipur (300)	109 (36.33)
Season	Summer (400)	172 (43.00%) **
	Rainy (400)	130 (32.50%)
	Winter (400)	127 (31.75%) **
Farmers Economic condition	Moderate (815)	266 (32.63%) **
	Poor (377)	158(41.91%))
	Ultra poor (8)	5 (62.50%) **
Bred	Cross bred (146)	54 (36.99 %)*
	Local (1054)	375 (35.58%)*

Age	Calf (334)	103 (30.84%)
	Young(423)	156 (36.88%)
	Adult (443)	170 (38.37%)
Floor	Paka (620)	225(36.29 %)
	Mati (580)	204 (35.17%)
Sex	Male(309)	108(34.95%)
	Female (891)	321 (36.03%)

** Significance at P <0.05, **Significance at P< 0.01*

DISCUSSION

Overall prevalence of gastrointestinal parasitic infections

The overall prevalence of gastrointestinal parasitic infections in cattle during this study (35.75%) showed partial consistency with the observation of Alim (2011) who recorded 39.75 % prevalence in cross bred cattle in Chittagong division. Rahman and Razzak (1973) recorded 37.00% in Comilla district. In local cattle, the prevalence of gastrointestinal parasitic infections (35.58%) of this study were varied with the observation of Alim (2011), Hirani *et al.*, (2006) and Swai *et al.*, (2006), who recorded 46.25% in Chittagong district, Bangladesh, 45.8% in Gujarat, India and 47.00% in Tanzania, respectively. The prevalence of gastrointestinal parasitic infections in cattle of the present study varied widely from the reports of Bhuyan (1970), who observed 71.60% in Bangladesh. Variation in the occurrence of gastrointestinal parasites infections might be due to geo-climatic conditions, sample size, breed, age, sex, nutrition, stress, availability of intermediate host, vegetation, grazing pattern, rearing and husbandry measures, anthelmintic therapy, genetic resistance etc. (Hansen and Perry, 1993).

During this study the overall prevalence of parasitic infections in crossbred cattle were significantly higher than the local cattle. It may be due to the lower immunity of crossbred cattle than the local cattle or sample size because maximum were local cattle and minimum were crossbred cattle or the poor owner (maximum rearing local cattle) give more attention to their cattle. The overall prevalence of helminthes parasites in the coastal areas was 36.16 % which was almost similar to the report of Alim (2011). They reported that prevalence of GI parasite in crossbrd cattle in Noakhali district of Bangladesh was 39.29%. But the prevalence recorded in present study (35.34%) in the hilly areas was slightly lower than the results of Alim (2011) who found 37.97% infections in Khagrachori district of Bangladesh.

The prevalence of *Paramphistomum* spp infections of this study was higher than the observation of Alim (2011), Raza et al., (2010), who recorded 14.81% in Chittagong district, Bangladesh; 17.64% in Tehsil Jatoi district, Pakistan, respectively. However, prevalence of *Paramphistomum* spp infections showed somewhat consistency with the reports of Sardar *et al.*, (2006), who observed 25% in Mymensingh district, Bangladesh. The prevalence of *Schistosoma* spp infections as recorded in this study greatly varied from Alim (2011), Sardar *et al.*, (2006) and Masaba *et al.*, (1977), who recorded 5.55 % (crossbred) ,7.40% (local) in Chittagong district of Bangladesh, 29.44% (native), 37.78% (crossbred) in Mymensingh district, Bangladesh and 31.00% *Schistosoma bovis* infections in Tanzania, respectively. The prevalence of *Toxocara* spp infections in cattle was found inconsistent with Alim (2011) and Rahman and Ahmed (1991), who reported 5.50 % infections in Chittagong district of Banglades and 7.10% in different areas of Bangladesh, respectively. The occurrence of *Trichuris* spp infections was found lower than the reports of Alim (2011), Sardar et al., (2006), Rahman and Ahmed (1991) and Rahman and Razzak (1973), who reported 3.70% in Chittagong district, Bangladesh, 6.11%, 5.80% and 8.80% in different districts of Bangladesh, respectively.

The prevalence of strongyle parasites were inconsistent with Swai *et al.*, (2006); Singh et al., (2012) who recorded in Tanzania (20.00%) and India (10.69%) respectively. But the results of that study somewhat consistent with the Aktaruzzaman *et al.*,(2013) and Sathaporn, *et al.*, (2011), who reported 3.87% of single infection in crossbred cattle in Sirajgonj district, Bangladesh and 6.07% in Thailand. It may be due to the climatic conditions and temperature of those areas which play important role in the development of larval stages of strongyles. The occurrence of *Moniezia* spp infections was found in partially consistent with the reports of Saravanan *et al.*, (2009) and Samad *et al.*, (2004) who observed 1.00% in India, Mymensingh district, Bangladesh. The

prevalence of *Strongyloides* spp infections was recorded higher than the observation of Sardar *et al.*, (2006) and Garrels (1975), who recorded 1% infections in Mymensingh and 1.60% in Tangail, Bangladesh, respectively. Findings of *Strongyloides* spp infections showed similar with the reports of Vassilev (1999) and Rahman and Razzak (1973), who recorded 3.00% in Zimbabwe and 3.00% in Comilla district, Bangladesh, respectively.

The prevalence of Fasciola spp infections in local cattle showed similarity with the reports of Siddiki *et al.*, (2010), Saravanan *et al.*, (2009) and Shirale *et al.*, (2008), who observed 2.00% infections in Chittagong, Bangladesh, 2.90% fluke infections in Namakkal and 3.71% in Akola district, India, respectively. The prevalence of *Eimeria* spp in cattle of the present study was inconsistent with the report of Samad *et al.*, (2004) and Garrels (1975), who observed 27.00% infections in Mymensingh district, 12.2% infections in Tangail district respectively. The prevalence of *Balantidium coli* of the present study was consistent with the findings of Haque et al., (1998), who reported 2.19% of clinical balantidiasis in cattle. Low prevalence of *Balantidium coli* and *Eimeria* spp during the present study might be due to the administration of antiprotozoal drugs before sample collection.

Seasonal prevalence of gastrointestinal parasite infections

During this study, prevalence of gastrointestinal parasitic infections were recorded more in summer season which was differ with the reports of Sardar *et al.*, (2006), Aktaruzzaman *et al.*, (2013) and Alim (2011) who reported that the prevalence was higher in rainy season. The variation might be due to seasonal climatic fluctuation of that area and the Availability of vector of that area. Additionally, a subsequent lower occurrence of gastrointestinal parasitic infections in the winter season of the current research was almost similar with the observation of Aktaruzzaman *et al.*, (2013), Samad (2000); Shirale *et al.* (2008) and Chavhan *et al.* (2008). This might be due to low temperature in winter season provides unfavorable environment for the survival and development of parasitic larvae (Hansen and Perry, 1993).

Age specific prevalence of gastrointestinal parasitic infections

The overall prevalence of GI parasitic infections were found more in adult cattle than young and calf. Higher prevalence of gastrointestinal parasitic infections in adult cattle of this study showed consistency with the observation of Sardar *et al.*, (2006); Aktaruzzaman *et al.*, (2013) and Rahman and mondal (1983) who reported that prevalence of parasitic infections was higher in adult. The higher prevalence of parasitic infections in adult cattle might be due to keeping them for a longer period of time in breeding and milk production purposes or supplying inadequate feed against their high demand.

Sex-specific prevalence of gastrointestinal parasitic infections

In this present study the prevalence of parasitic infections was little higher in female which was not statistically significant. The was found in accordance with the reports of Siddiki *et al.*, (2010), who found no significance difference in the prevalence of parasitic infections in between male and female. Alim (2011); Raza *et al.*, (2010) and Regassa *et al.* (2006) who also reported higher prevalence of helminths in female cattle. In this study, variation in occurrence of such helminths in male and female animals might be due to the variation in sample size , lowered resistance of female animals or on the part of their reproductive events or temporary loss of acquired immunity near parturition (Garcia *et al.*, 2007 and Barger, 1993), stress, genetic resistance of host and insufficient/imbalanced feed against higher needs (Raza *et al.*, 2010 and Hansen and Perry, 1993).

CONCLUSION

In conclusion, no significance difference in the overall prevalence of gastrointestinal and haemoparasitic infection was observed in the hilly and coastal areas. But the significant ($P<0.05$) topographical variation was observed in case of *Paramphistomum spp, Fasciola spp, Toxocara spp* and *Strongyles* parasites. Significant ($P<0.05$) seasonal and breed variation in the prevalence of gastrointestinal parasitic infection and significant seasonal variation in the prevalence of haemoparasitic infection was also interesting. Further intensive experimentation is required to identify possible disease vectors along with their epidemiological factors which will eventually help in the formulation of suitable prevention and control strategies against possible parasitic infection.

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