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RESEARCH ARTICLE

Prevalence of Hemoprotozoan Diseases in Cattle Population of Chittagong Division, Bangladesh

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ABSTRACT

A one year (2009-10) prevalence study on hemoprotozoan diseases was conducted in crossbred and indigenous cattle, Chittagong, Bangladesh. Blood samples were collected randomly from 216 crossbred and 432 indigenous cattle of four representative areas in three consecutive seasons. Samples were examined by Giemsa's stained blood smear method. The effect of topography, season, age and sex was observed in cattle during this study. The overall prevalence of hemoprotozoan diseases was 16.18 and 12.02% in crossbred and indigenous cattle, respectively where babesiosis and anaplasmosis were predominant. Babesiosis was found to be consistent in all the four different areas but highest prevalence (9.25%) was found in hilly area. Hemoprotozoan diseases were predominant in summer season followed by rainy and winter seasons. Adult cattle were significantly ($P<0.05$) susceptible to babesiosis than younger. Female animals were more susceptible to hemoprotozoan infections than male where babesiosis in crossbred cattle was statistically significant ($P<0.05$). It could be stated that breed and season were the important predictor of hemoprotozoan diseases. We recommended further studies for molecular detection of such diseases and identification of tick vectors in the study areas which will assist to take necessary preventive measures.

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INTRODUCTION

Hemoprotozoan diseases especially babesiosis, anaplasmosis, theileriosis and trypanosomiasis are considered some of the major impediments in the health and productive performance of cattle (Rajput *et al.*, 2005). Tick-borne diseases cause substantial losses to the livestock industry throughout the world (Ananda *et al.*, 2009; Kakarsulemankhel, 2011) as these have got a serious economic impact due to obvious reason of death, decreased productivity, lowered working efficiency (Uilenberg, 1995), increased cost for control measures (Makala *et al.*, 2003) and limited introduction of genetically improved cattle in an area (Radostits *et al.*, 2000).

Different blood protozoa such as *Babesia bigemina, Theileria annulata, Theileria mutans* and rickettsia like *Anaplasma marginale, Anaplasma centrale* have been reported in animals of Bangladesh (Samad and Gautam, 1984). Samad *et al.* (1989) also recorded trypanosomiasis in North western region of the country. Among hemoprotozoan diseases, babesiosis and anaplasmosis are the more prevalent in different areas of Bangladesh where Samad *et al.* (1989) recorded the highest 14.53% babesiosis and Chowdhury *et al.* (2006) recorded 70% anaplasmosis in Sirajgong district. Talukdar and Karim (2001) also documented higher prevalence (33%) of anaplasmosis in Baghabari Milk Shed Area, Sirajgong. Siddiki *et al*. (2010) recorded lower prevalence of hemoprotozoan diseases in Red Chittagong Cattle as compared to crossbred cattle in some areas of Chittagong district. According to the previous reports hemoprotozoan diseases were more frequent in crossbred cattle. Native cattle have considerable resistance against such diseases due to continuous exposure of tick vectors.

However, the topography of Chittagong division was much diversified. The region comprises plane, costal, semi-hilly and hilly areas. Besides this, Chittagong is one of the most important dairy belts in Bangladesh where dairy sector is expending in a noticeable way. But, investigations for hemoprotozoan diseases in Chittagong region especially in hilly and costal areas were less focused by the previous researchers. On the other hand, the climatic condition and geographical location of the areas might favor the growth and multiplication of different vectors. Therefore, the present study was undertaken to investigate the prevalence of hemo-protozoan diseases of cattle considering breed, age, sex, seasons etc. at four different locations of Chittagong division. The current study will give an overall idea about the distribution of hemoprotozoan diseases in the region which may assist the clinicians to diagnose such diseases and aware the farmers to take appropriate control measures against tick vectors.

MATERIALS AND METHODS

Study Design: The research was conducted in four topographically different areas, namely Noakhali sadar (Costal), Boalkhali (Plane) Rangunia (Semi- hilly), and Khagrachori sadar (Hill tract) of Chittagong division. Holstein Friesian (HF) crossbred (*Bos taurus* X *Bos indicus*) and indigenous cattle (*Bos indicus*) were selected for this study as target animals. Selected animals were categorized into three age groups: calves (≤1 year), young (>1–2.5 years) and adult (≥2.5 years) for HF crossbred and for indigenous cattle age limit differed for young (>1-3.5 years) and adult (≥3.5 years) cattle only (Sastrt and Thomas, 2005). In each season, 72 HF crossbred cattle were considered where 30 adult, 14 young and 28 calves were taken from different dairy farms of Noakhali sadar. On the other hand, 144 indigenous cattle were taken in each season from household cattle where 36 animals from each mentioned area including 12 from each age group. Samples were collected randomly in three consecutive seasons; summer (March to May), rainy (June to August) and winter (October to December).

Sample collection and microscopic examination: Approximately 3-5 ml of blood sample was collected from jugular vein using 10 ml disposable plastic syringe from each animal and then preserved in BD Vacutainer® tube containing anticoagulant (Lithium Heparin). The wet blood smears were immediately examined under microscope at the pertinent sampling areas to observe the movement of Trypanosome (Ulienberg, 1998). The collected blood samples were carried out to the Parasitology Laboratory of Chittagong Veterinary and Animal Sciences University (CVASU). Further examination was done by preparing two thin smears from each blood sample (Hendrix and Robinson, 2006) and subsequently stained with Giemsa's stain. Fifty fields from each stained slides were examined under binocular microscope (X 100) for identification of blood protozoa at genus level (Urquhart *et al*., 1996).

Data analysis: Obtained data were analyzed by using statistical software 'STATA/IC-11.0' where descriptive statistics was expressed as proportion with 95% confidence interval (CI). For Chi-Square Test, results were expressed in percentage with P-value and significance was determined when $P<0.05$.

RESULTS

The overall prevalence of hemoprotozoan diseases was 16.18% (CI, 11.2-21.1) in crossbred and 12.02% (CI, 8.9-15.1) in indigenous cattle. The prevalence of babesiosis was 9.25% (CI, 5.3-13.1) and 7.17% (CI, 4.7-9.6) in crossbred and indigenous cattle, respectively. HEMOPROTOZOAN diseases were found to be more prevalent (12.5%) in summer season followed in order by rainy and winter seasons. The lowest prevalence (0.70%) was found in theileriosis in winter season. Age specific prevalence of hemoprotozoan infections revealed that adult cattle showed more susceptibility to hemoprotozoan diseases than calves. Babesiosis increased significantly ($P<0.05$) with the increase of age and the highest prevalence (17.78%) was observed in adult crossbred cattle. Prevalence of anaplasmosis, theileriosis and mixed infections also varied according to age of cattle. However, female cattle were more prone to hemoprotozoan diseases than male. Significantly higher prevalence (12.17%) of babesiosis was recorded in female crossbred cattle. Topographical study exposed that babesiosis was consistently prevalent in all the locations and the highest overall prevalence was recorded in Rangunia (9.25%) but it was not significant (Table 1 and 2).

DISCUSSION

The overall prevalence of hemoprotozoan diseases in this investigation partially consistent with the earlier report of Kamani *et al.* (2010) who recorded slightly higher prevalence in Nigeria. Chowdhury *et al.* (2006) and Ananda *et al.* (2009) also documented higher prevalence of hemoprotozoan diseases. Lower prevalence of

Table 1: Prevalence of hemoprotozoan diseases in crossbred (*Bos indicus* x *Bos taurus*) cattle of Noakhali sadar area

Variables	Category	N	Babesiosis		Anaplasmosis		Theileriosis		Mixed infection	
			%	P value	%	P value	%	P value	%	P Value
Season	Summer	72	12.5	0.48	5.56	0.65	2.78	0.77	1.39	0.36
	Rainy	72	8.33		5.56		1.39		0	
	Winter	72	6.94		2.78		1.39		0	
Age	Calf	84	1.19	0.001*	2.38	0.14	3.57	0.29	0	0.49
	Young	42	7.14		7.14		0		0	
	Adult	90	17.78		5.56		1.11		1.11	
Sex	Male	60	1.67	0.017*	5.0	0.87	0	0.21	0	0.53
	Female	156	12.17		4.48		2.56		0.64	

N= No. of animals, %=Percentage, * Significant ($P<0.05$).

Table 2: Prevalence of hemoprotozoan diseases in indigenous cattle (*Bos indicus)*

Variables	Category	N	Babesiosis		Anaplasmosis		Theileriosis		Mixed infection	
			%	P value	%	P value	%	P value	%	P Value
Location	Noakhali	108	4.62	0.56	3.70	0.97	1.85	0.14	0	0.39
	Boalkhali	108	6.48		3.70		0		0	
	Khagrachori	108	8.33		3.70		2.78		0.92	
	Rangunia	108	9.25		2.78		0		0	
Season	Summer	144	9.02	0.37	6.25	0.083	2.08	0.44	0	0.36
	Rainy	144	7.63		2.08		0.70		0	
	Winter	144	4.86		2.08		0.70		0.69	
Age	Calf	144	1.39	0.00	1.39	0.23	1.39	0.24	0	0.36
	Young	144	6.25		4.86		0		0	
	Adult	144	13.89		4.16		2.08		0.69	
Sex	Male	126	5.56	0.40	4.76	0.34	1.59	0.59	0	0.52
	Female	306	7.84		2.94		0.98		0.32	

N= No. of animals, %=Percentage, * Significant (P<0.05).

hemoprotozoan diseases in the current study might be due to random sampling rather than selection of clinically susceptible cattle. However, variation in geo-climatic condition, breed, exposure of vectors and age of the animals might contribute to variable prevalence of hemoprotozoan diseases in the study areas (Muhanguzi *et al.,* 2010). In the present research, lower prevalence of blood protozoan infections in indigenous cattle as compared to HF crossbred cattle was found in agreement with the reports of Radostits *et al.* (2000). Constant exposure of infections and development of immunity against such infections might responsible for lower prevalence in indigenous cattle (Siddiki *et al*., 2010). On the contrary, more attention in the management of HF crossbred cattle gives less chance of pre exposure of vectors and develop no or less immunity, resulting frequent occurrence of such diseases (Chowdhury *et al.,* 2006; Ananda *et al.,* 2009; Siddiki *et al*., 2010).

The prevalence of babesiosis in indigenous cattle was found partially consistent with the report of Kalkan *et al.* (2010). Babesiosis in crossbred was found somewhat similar with the reports of Lako *et al.* (2007) and Kamani *et al.* (2010). The overall prevalence of babesiosis of the present study was higher than the reports of Chowdhury *et al.* (2006) and Siddiki *et al.* (2010) which might be due to variation of study areas or availability of tick vectors. Higher prevalence of babesiosis in the study population suggested a continuous challenge of such infection in those areas. Overall prevalence of anaplasmosis was in agreement with the reports of Samad *et al.* (1989), Siddiki *et al.* (2010) and Muhanguzi *et al.* (2010). The observed result of this study indicated a constant trend of such infection in the study areas due to frequent transmission of organisms by tick vectors or mechanical means. Higher prevalence of anaplasmosis in different areas of the world was explained by endemicity of the disease (Brito *et al*., 2010).

Hemoprotozoan diseases vary greatly according to seasons. Observation of rainy season of this research was in accordance with the report of Ananda *et al.* (2009). Radostits *et al.* (2000) observed that higher incidence of hemoprotozoan diseases were found soon after peck of tick population depending on temperature, humidity, rainfall etc. which might be accounted for higher prevalence of such infections in rainy season of the study. Occurrence of theileriosis was found in line with the reports of Muhammad *et al.* (1999) and Zahid *et al.* (2005). Lower temperature and humidity of winter months were less favorable for the growth and multiplication of tick vectors which might contribute to lower frequency of such diseases in the study population (Muhammad *et al.,* 1999; Zahid *et al.,* 2005).

Age also influences the occurrence of haemo-protozoan diseases. In the current study, higher susceptibility of adult cattle to hemoprotozoan diseases were found consistent with the findings of Ananda *et al.* (2009) who reported higher prevalence in animals aged more than 3 years followed by the lower prevalence in 1-2 years of age. Observation of this study also supported by the findings of Kamani *et al.* (2010) who observed higher prevalence in adult than young cattle. Findings of babesiosis in this investigation were supported by the observation of Urquhart *et al.* (1996) and Annetta *et al*. (2005) who reported an inverse age resistance of the disease where adult showed more susceptibility than calves. This might be due to rapid immune responses to primary infection by the calves through a complex immune mechanism (Annetta *et al*., 2005). Prevalence of anaplasmosis in study population supported the reports of Chakraborti (2002) and Chowdhury *et al.* (2006) who observed comparatively higher prevalence in adult than calves. Endemic instability of the study areas might responsible for frequent infections in adult cattle where newborn calves were protected by colostral immunity (Cynthia *et al*., 2011). On the contrary, earlier observation was in contrast with the observation of Muhanguzi *et al*. (2010) who found higher prevalence of anaplasmosis in calves and lowest in young cattle in Uganda and the difference was explained by dominant immune responses to *Anaplasma* spp. infection. Prevalence of theileriosis in calf in the present study was partially consistent with Savini *et al.* (1999). Lower prevalence of theileriosis might be due to innate resistance which usually limits mortality to a low level (Urquhart *et al*., 1996).

The prevalence of hemoprotozoan diseases in female cattle of this investigation showed uniformity with the report of Kamani *et al.* (2010). Higher prevalence in female cattle possibly due the fact that they were kept longer for breeding and milk production purpose, supplied insufficient feed against their high demand (Kamani *et al.,* 2010) or variation in sample size.

Conclusions: Hemoprotozoan diseases were strongly associated with breed of animals where HF crossbred were more susceptible than indigenous cattle. Babesiosis and anaplasmosis were predominant diseases in the study areas. Frequency of blood protozoan infections increased with weather change where summer season was found most vulnerable. Cattle of any age could be affected by hemoprotozoan diseases but inverse age resistance was noticed in the occurrence of babesiosis. Finally, we recommended further studies focusing identification of tick vectors along with molecular detection of hemoprotozoan diseases for taking further control strategies in the study areas.

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