



PREVALENCE OF THEILERIOSIS AND BABESIOSIS IN CATTLE IN SIRAJGANJ DISTRICT OF BANGLADESH

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A study was conducted to investigate the prevalence of theileriosis and babesiosis in cattle in Sirajganj district of Bangladesh during the period of December 2013 to November 2014. During one year study period a total of 395 cattle were examined, 23 and 8 were found to be infected with *Theileria* spp. and *Babesia* spp., respectively. On Geimsa stained blood smear examination, it was observed that the overall prevalence of theileriosis and babesiosis in cattle were recorded as 5.82% and 2.27% respectively. The effect of age, sex, breed and season was observed in cattle during this study. The highest prevalence of theileriosis (7.25%) and babesiosis (3.10%) was reported in the older cattle (>3 years of age) and the higher prevalence was observed in female (6.66% and 2.59%, respectively) than male (4.0% and 1.60% respectively). All crossbred cattle was showed higher prevalence than local cattle. The prevalence of theileriosis was noticed as the highest in the rainy season (6.25%) in relation to summer (5.83%) and winter (5.05%) season. But the prevalence of babesiosis was ranked the highest in summer season (2.50%) followed in rainy (2.27%) and winter (2.02%) season that was insignificant. From the study it was evident that cattle were infected with the organisms and caused a heavy economic loss which will assist to take necessary preventive measurements.

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INTRODUCTION

Babesiosis and Theileriosis are febrile, tick-borne haemoprotozoan diseases of cattle, caused by *Babesia* spp. and *Theileria* spp. respectively, wide spread in tropical and sub-tropical regions of the world. Among tick-borne hemoprotozoan parasites of vertebrates *Theileria* and *Babesia* are the species that have a major effect on livestock health (Mehlhorn and Schein, 1984). Babesiosis, like most haemoparasites, has generally been shown to cause destruction of red blood cells resulting in anaemia, jaundice, anorexia, weight loss and infertility (Ellis et al., 2003); and *Theileria* sp. is a common protozoan parasite of cattle transmitted by *Hyalomma* sp. ticks, responsible for tropical theileriosis, a disease which has been reported from various parts of the world (Oliveira et al., 1995; Durrani et al., 2010; Tavassoli et al., 2011). 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).

Bangladesh is usually hot and humid except in winter, and the climatic condition of Bangladesh is very conducive to a wide variety of parasites as well as ticks (Razzak and Shaikh, 1969) which have been recognized as the notorious threat due to severe irritation, allergy and toxicosis (Niyonzema and Kiltz, 1986). Prevalence of blood protozoa such as *Babesia bigemina*, *Theileria annulata*, *Theileria mutans* has been reported in animals of Bangladesh (Ahmed, 1976; Samad and Gautam, 1984); where Alim et al. (2012) observed that the prevalence of theileriosis and babesiosis was 4.62% and 1.85%, respectively in Noakhali district, and 8.33% and 2.78%, respectively in Khagrachori district. Chowdhury et al. (2006) recorded the prevalence of *Babesia bigemina* infection in cattle was 3.30% in Sirajganj sadar area of Bangladesh. Outbreaks of clinical illness do not occur uniformly in tick-infected areas due to the differences in genetic or age resistance of the cattle, variations in tick populations, numbers of infected ticks and established control methods (de Castro, 1997). Kamani et al. (2010) observed that the higher prevalence was found in adult than young cattle. Sarkar (2007) and Khattak et al. (2012) also found that the higher prevalence was showed in female than male. Prevalence of the disease was higher in crossbreed cattle than local cattle which was reported by Siddiki et al. (2010) and Esin et al. (2012). Seasonal variation on tick infestation was reported by Zahid et al., (2005) and Sanjay et al. (2007) where they reported that the prevalence of tick infestation was significantly more during the rainy season. Sirajganj is the most important dairy belt of Bangladesh and the density of cattle population of this district is high. The climatic condition and geographical location of the areas might favor the growth and multiplication of ticks which act as natural vectors of babesiosis and theileriosis that causes one of the major veterinary problems affecting livestock industries. Considering the above situations, the present research was undertaken to know the prevalence of babesiosis and theileriosis of cattle in Sirajganj district of Bangladesh.

MATERIALS & METHODS

Geographical location of study area

Sirajganj district is situated in Rajshahi Division of Bangladesh; its geographical coordinates are 24° 27' 0" North, 89° 43' 0" East. Sirajganj has an area of 2,498 sq.km (964 sq miles) including reverine areas, and it represents around 1.7 percent of the total area of Bangladesh. It ranks 3rd in size among the eight districts of Rajshahi division and 25th among the 64 districts of Bangladesh. It contains 9 upazilas namely SirajganjSadar, Shahjadpur, Ullapara, Kamarkhand, Belkuchi, Chouhali, Raigonj, Tarash and Kazipur. The annual average temperature of the district reaches a maximum of 34.6 °C, and a minimum of 11.9 °C. The annual rainfall is 1610 mm (63.4 in).

Experimental animals and duration of study

This research work was conducted at the Field Diseases Investigation Laboratory (FDIL), Sirajganj on the clinical cases in cattle during the period from December 2013 to November 2014. During one year study period, a total of 395 case of sick and suspected cattle were studied that was informed by farmers, Veterinary Field Assistant, Veterinary Surgeon and Upazila Livestock Officer of respective upazila of Sirajganj district.

Only 23 and 9 cattle were infected by *Theileria* spp and *Babesia* spp. among 395 suspected cases. Date, age, sex, breed and complaint of the owner of all studied animal were noted in the registered book. All this information and data were collected from the disease register book of the FDIL, Sirajganj.

Methods followed for diagnosis

The history and physical examination of each of the patient were carried out for the cattle are briefly described below:

History/Anamnesis

History of patient like (a) Date of examination, (b) Signalment (client and patient) identification, (c) Chief complaint, (d) Patient illness, (e) Past medical history were included. In addition, the complete medical history like (a) Family medical history, (b) Vaccination history, (c) Travel history, (d) Diet history, (f) Environmental history, (g) Birth history (h) Potential source of intoxication were investigated.

Physical examination

Physical examination was done by visual inspection, pulse & respiration rate and rectal temperature. Examination of the different organs and systems of the body was carried out by using the clinical methods of palpation, percussion and auscultation.

Sample collection and examination

3-5 ml blood samples were collected from the jugular vein of the clinically suspected animals in EDTA containing vacutainers and transported to FDIL, Sirajganj in ice bags for microscopic examination following the method of Adam, Paul and Zaman. Briefly, a thin blood smear was prepared from each blood sample, air dried and fixed in methanol for 2-3 minutes. Staining was done in 5% Giemsa's stain and rinsing was performed in two changes of distilled water buffered to pH 7.2, then examined under microscope (100x) with immersion oil for the identification of blood parasites as described by Soulsby (1982).

Statistical analysis

Data were entered in Microsoft Excel 2007 and transferred to R 2.14.2 (The R Foundation for Statistical Computing, Vienna, Austria). Descriptive statistics were obtained using Data Mining package of the software R 2.14.2

RESULTS AND DISCUSSION

Overall prevalence of theileriosis and babesiosis in cattle

Overall prevalence of theileriosis and babesiosis of cattle in Sirajganj district is shown in table 1. The overall prevalence of Theileriosis and Babesiosis of cattle in Sirajganj district was 5.82% and 2.27% respectively. The present study supports with the report of Khattak et al. (2012) who observed that the overall prevalence of Theileriosis on Giemsa stain was 5.20% in Khyber PukhtoonKhwa province (Pakistan). Similar results were also observed by Mohammed Safieldin et al. (2011) who found that the prevalence of *Theileria* species infection in dairy cattle in Omdurman locality, Sudan was found to be 7% for dry cool season while the prevalence of *Babesia* species infection was 1%. In Bangladesh, similar findings were also reported by Alim et al. (2012) where he observed that the prevalence of theileriosis and babesiosis was 4.62% and 1.85% respectively in Noakhali district, and 8.33% and 2.78% respectively in Khagrachori district. Babesia infection (2.27%) recorded in this study is similar to the report of Shahidullah (1983) who recorded the prevalence of babesiosis was 2.29% on microscopic peripheral blood smear examination. Samad et al. (1989) and Chowdhury et al. (2006) recorded a comparatively higher (3.28% and 3.30% respectively) prevalence of *Babesia bigemina* infection in cattle of the selected Milk vita project areas of Bangladesh and Sirajganj sadar area of Bangladesh respectively. But Banerjee et al. (1983) detected very high (14.53%) prevalence of *Babesia bigemina* in cattle of Bangladesh.

Table 1. Overall prevalence of theileriosis and babesiosis of cattle in Sirajganj district

Name of Diseases	No. of cattle tested (for both diseases)	No. of positive case	Prevalence (%)
Theileriosis	395	23	5.82
Babesiosis		9	2.27

Age-wise prevalence

Age-wise prevalence of Theileriosis and Babesiosis in cattle is shown in table 2. Age also influences the occurrence of the infections. The highest prevalence of Theileriosis and Babesiosis was found in the age of above 3 years (7.25% and 3.10% respectively), followed in >2-3 years (5.12% and 1.70% respectively) and 6 months – 2 years of age (3.52% and 1.17% respectively). Similar results were found by Kamani et al. (2010) who observed higher prevalence in adult than young cattle. The results of present study agree with Islam et al. (2009) who found that prevalence of tick infestation was higher in old cattle than young. Observation of this study also supported by 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. 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). 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). Age resistance, perhaps in combination in some cases with maternal antibodies, is reflected in the reduced number of clinical outbreaks in young animals.

Table 2. Age-wise prevalence of theileriosis and babesiosis in cattle

Age group	No. of cattle tested	Theileriosis		Babesiosis	
		No.	%	No.	%
6 months-2 years	85	3	3.52	1	1.17
>2-3 years	117	6	5.12	2	1.70
Above 3 years	193	14	7.25	6	3.10
Total	395	23	5.82	9	2.27

Sex-wise prevalence

Sex-wise prevalence of Theileriosis and Babesiosis in cattle is shown in table 3. In case of both Theileriosis and Babesiosis, the higher prevalence was observed in female (6.66% and 2.59% respectively) than male (4.0% and 1.60% respectively). Similar findings were found by Singh et al. (2012) and Khattak et al. (2012) where they separately observed that the prevalence of theileriosis was higher in female than male. This result also agree with the report of Sarkar (2007) who reported the prevalence of ectoparasites (ticks) were significantly higher in female than male. 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.

Table 3. Sex-wise prevalence of Theileriosis and Babesiosis in cattle

Sex group	No. of cattle tested	Theileriosis		Babesiosis	
		No.	(%)	No.	(%)
Male	125	5	4.0	2	1.60
Female	270	18	6.66	7	2.59
Total	395	23	5.82	9	2.27

Breed-wise prevalence

Breed-wise prevalence of Theileriosis and Babesiosis in cattle is shown in table 4. The highest prevalence of Theileriosis was recorded in HF×L (6.66%) followed by SL×L (6.18%), S× L (5.55%) and local (4.54%). In case of Babesiosis, the highest prevalence was reported in HF×L (2.50%) followed by local (2.27%), S× L (2.22%) and SL×L (2.06%). In the present study, higher prevalence of *Theileria* infections in crossbreed cattle as compared to local cattle was found. Breed differences are also important in the susceptibility of cattle to tick borne diseases. Cattle of European origin like Holstein are usually highly susceptible (Esin et al. 2012). Breed susceptibility of Babesiosis also recorded in this study support the report of Chakraborti A, (2002). Variation in geo-climatic condition, breed, and exposure of vectors and age of the animals might contribute to variable prevalence of hemoprotozoan diseases in the study areas (Muhanguzi et al., 2010). 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).

Table 4. Breed-wise prevalence of Theileriosis and Babesiosis in cattle

Breed	No. of cattle tested	Theileriosis		Babesiosis	
		No.	%	No.	%
Local	88	4	4.54	2	2.27
HF×L	120	8	6.66	3	2.50
SL×L	97	6	6.18	2	2.06
S× L	90	5	5.55	2	2.22
Total	395	23	5.82	9	2.27

Local=Indigenous cattle, HF = Holstein-Friesian, SL = Sahiwal, S = Sindhi, L= Local cattle

Table 5. Season-wise prevalence Theileriosis and Babesiosis in cattle

Season	No. of cattle tested	Theileriosis		Babesiosis	
		No.	%	No.	%
Summer	120	7	5.83	3	2.50
Rainy	176	11	6.25	4	2.27
Winter	99	5	5.05	2	2.02
Total	395	23	5.82	9	2.27

Summer: March- June; Rainy: July-October and Winter: November-February

Season-wise prevalence

Season-wise prevalence of Theileriosis and Babesiosis in cattle in the study area is shown in table 5. The prevalence of Theileriosis was ranked the highest in rainy season (6.25%) in relation to summer (5.83%) and winter (5.05%) season. But the prevalence of Babesiosis was observed the highest in summer season (2.50%), followed by rainy (2.27%) and winter (2.02%) season. Occurrence of theileriosis was found in line with the reports of Muhammad et al. (1999) and Zahid et al. (2005). Observation of rainy season of this research was in accordance with the report of Ananda et al. (2009). Radostiis et al. (2000) observed that higher incidence of haemoprotozoan 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. 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). Salih et al. (2008) found the highest number of ticks occur during the rainy season. Sanjay et al. (2007) also reported the seasonal prevalence of tick infestation significantly more during the rainy (24.33%) and summer seasons (21.58%) as compared to the winter season

(4.03%). This variation may be due to geographical location, climatic condition, reproduction of tick and tick population. The present study recorded a higher prevalence of Babesiosis in summer season which was agreed with the report of Rony et al. (2010) where he noticed that the prevalence of ectoparasites/ tick infestation was higher in summer season. The rise of infestation in summer may be due to rise of temperature in late winter leading to gradual increase in the load as well as percentage of infestation in May and June (Roy et al. 2001).

Tick transmitted haemoprotozoan diseases especially babesiosis, theileriosis and anaplasmosis are considered some of the major impediments in the health and productive performance of cattle (Rajput et al., 2005); affecting livestock industries in many parts of the world (Hourrigan, 1979). In some cases, ticks have been reported to cause lowered productivity, mortality (Niyonzema and Kiltz, 1986) and transmit the diseases (Norval *et. al.*, 1984). Haemoprotozoan diseases of cattle have also been recorded from some districts of Bangladesh (Samad et al. (1983); which are one of the major constraints for profitable dairy industry in tropical and subtropical countries including Bangladesh. *Theileria* and *Babesia* species are among the major piroplasms of cattle and small ruminants (Uilenberg, 1995; Gubbels et al., 1999; Oura et al., 2004; Oura et al., 2005); which cause significant economic losses in tropical and sub-tropical regions of the world (Uilenberg, 1995; Kursat et al., 2004; Jongejan and Uilenberg, 2004).

From the above discussion it is concluded that the prevalence of theileriosis and babesiosis is the most common and frequent in Sirajganj district of Bangladesh which may be due to its agro-ecological and geoclimatic conditions, high density of cattle population, lowland/flood plain based area and high density of tick population. So, for the control and eradication of the diseases in cattle population of Bangladesh specially Sirajganj district, epidemiological surveillance is the important aspect along with more attention should be paid towards separation of healthy and infected animals/herds and strictly followed with biosecurity in cattle farm. Reduction of tick population and tick's reproduction is the main issue for control of the diseases. This should be combined with more government intervention in with awareness program should be undertaken involving stakeholders in the livestock industry as well as consumers to avert public health, veterinary public health and economic losses associated with the mentioned diseases.

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