Research Article

Prevalence and Associated Risk Factors of Bovine Ephemeral Fever in the Cattle of Nageshwari Upazila, Kurigram, Bangladesh

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Abstract | The Bovine Ephemeral Fever (BEF) is a viral disease transmitted by vectors among the cattle, which causes serious economic losses in the tropical and sub-tropical areas. This cross-sectional study aimed to estimate the prevalence of BEF and identify risk factors among cattle in Nageshwari Upazila, Kurigram District, Bangladesh. A clinical examination of 280 cattle that are of diverse age grouping, sex, and breed was done in January to April 2025. Structured questionnaires were used to collect information on different categories. The prevalence rates of BEF were 7.86% in total: the highest prevalence occurred in January (12.5%) and gradually decreased until April (2.86%), which are in agreement with the existence of seasonal patterns depending on the activity of the vectors. The highest prevalence in accordance to age was in cattle aged between 1 to 3 years (10.17%) and above 5 years (9.52%). There was greater prevalence in Male (9.68%) than in Female (7.34%) and in local breeds (8.64%) than in crossbreeds (5%). Nevertheless, all these differences were not of a statistical significance ($p > 0.05$). These findings suggest BEF occurrence is more influenced by environmental and vector-related factors than by age, sex, or breed. The results will give significant baseline epidemiological data that would present a guide to future research and control plans in Bangladesh.

Keywords | Bovine ephemeral fever (BEF), Prevalence, Risk factors, Cattle, Kurigram, Bangladesh

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INTRODUCTION

Bovine Ephemeral Fever (BEF), also called as three-day sickness is a viral disease of cattle and buffaloes in areas with subtropical and tropical climates (Akakpo, 2015). It is considered an acute tropical disease and important economically. The Bovine Ephemeral Fever Virus (BEFV) which is of the genus *Ephemerovirus* in family *Rhabdoviridae* causes it. BEFV virion is a bullet-shaped, slightly tapered at one end envelope that is normally between 70 nm in diameter (60-80 nm), 145 nm in length (120-170 nm) (Holmes and Doherty, 1970; Gubala *et al.*, 2008). Clinical signs that are more or less consistent with this disease include sudden onset of high fever, muscle stiffness, lameness, decreased feed intake, and clinical signs that normally persist up to three days. BEF has a low case fatality rate but produces significant economic losses because of the reduced milk yield, temporary infertility, interference with labor, and high susceptibility to secondary infections (Walker and Klement, 2015).

It is spread through blood-feeding arthropods, especially mosquitos (*Culex* spp.) and biting midges (*Culicoides* spp.) and a common outbreak takes place during a time that there is a higher activity by the spreading arthropod (Davies and Walker, 1974). Infected animals may show fever up

to 41.5 °C, nasal discharge, shaking of the muscles, and recumbency of pain in the joint and muscle. Specifically, in high producing dairy cows, complications occur, most prominently mastitis, pneumonia, and reproductive complications (Radostits *et al*., 2007; OIE, 2021).

BEF has been described in Africa, the Middle East, Asia and northern Australia, with a seasonal pattern related to climatic conditions that favour the proliferation of vectors (OIE, 2021). In Asia, outbreaks have generated significant effects on the economies of, among others, India, China, Japan, and Thailand. Within the past years, researchers have discussed the effects of climate change and environmental changes shifting geographic range of insect vectors, which may result in the extended global distribution of BEF (Samy and Peterson, 2016).

In a situation like Bangladesh where the national population of cattle is approximated to be around 24 million (DLS, 2023), BEF becomes a hidden menace to livestock productivity. However, despite cases of sporadic BEF-like cases being detected, especially during monsoon and post-monsoon phases (Samy and Christley, 2018). Other factors such as poor disease surveillance, absence of molecular diagnostic systems, and regular misdiagnosis of the disease with other febrile diseases can be used. As the country relies on the cattle to produce dairy, draft power and provides income in rural areas, more consideration to BEF should be paid to handle the disease and retains financial sustainability.

Objectives of the study

To assess the epidemiological characteristics of Bovine Ephemeral Fever (BEF) among cattle in selected regions of Bangladesh.

- To identify the spatial and seasonal patterns associated with BEF occurrence.
- To evaluate farmers' awareness, attitudes, and practices regarding BEF.

MATERIALS AND METHODS

Study area and population

The study will be conducted on the Nageshwari Upazila of Kurigram District of Bangladesh from January to April, 2025, in areas with a large population density of cattle (Figure 1). A total population of 280 cattle will take part in the study.

Diagnosis of bovine ephemeral fever

A tentative diagnosis of BEF is primarily based on clinical signs, epidemiological data and seasonal occurrence. According to Akakpo (2015) key indicators include:

- Sudden onset of high fever (up to 41.5 °C)
- Stiffness and lameness (often shifting limbs)
- Reluctance to move, recumbence
- Nasal discharge, salivation, and depression
- Rapid recovery within 2–3 days (hence "three-day sickness")
- Occurrence during warm, humid seasons (vector activity peak)
- Herd-level outbreaks with high morbidity but low mortality
- Laboratory confirmation (e.g., PCR, ELISA, virus isolation) is needed for a definitive diagnosis.

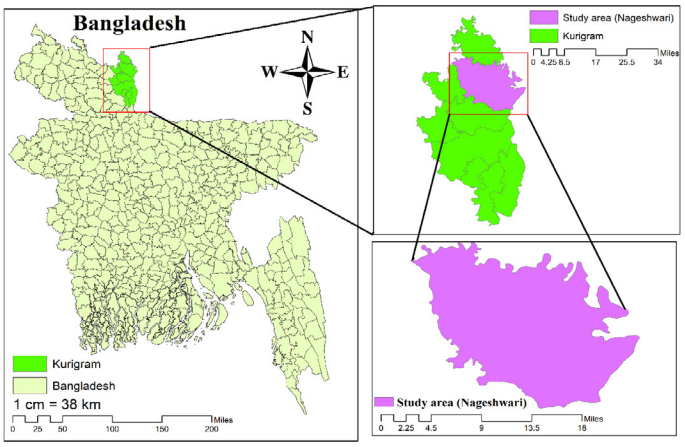

Figure 1: BEF Study area (Nageshwari, Kurigram).

Data collection

Clinical observation on cattle will observe symptoms of Bovine Ephemeral Fever (BEF) such as fever, stiffness in the muscles, lameness, recumbence, and decreased feeding. An epidemiological questioner will be used to obtain information on the possible risk factors, including age, breed, sex, history of vaccination and recent contact with insect vectors (Walker and Klement, 2015).

Data analysis

Raw data were coded and entered into Microsoft excel in order to analyze the data. Clinical cases and related risk factor distributions were summarized based on the use of descriptive statistics. The association between categorical variables was determined using chi-square tests, whereas the independent predictors of BEF infection were determined using logistic. The study map was prepared with the help of ArcGIS tools. A p-value < 0.05 will be considered statistically significant.

RESULTS

Table 1 and Figure 2 provides the prevalence of Bovine Ephemeral Fever (BEF) in cattle on a monthly basis with a total prevalence of 7.86 (22/280). The highest prevalence was always recorded in January (12.50%), and February (10%), whereas the lowest prevalence was observed in April (2.86%).

Table 1: Monthly prevalence of bovine ephemeral fever (BEF) in cattle.

Month	Total population	Positive cases	Prevalence (%)
Overall prevalence	280	22	7.86%
January prevalence	64	8	12.50%
February prevalence	80	8	10%
March prevalence	66	4	6.06%
April prevalence	70	2	2.86%

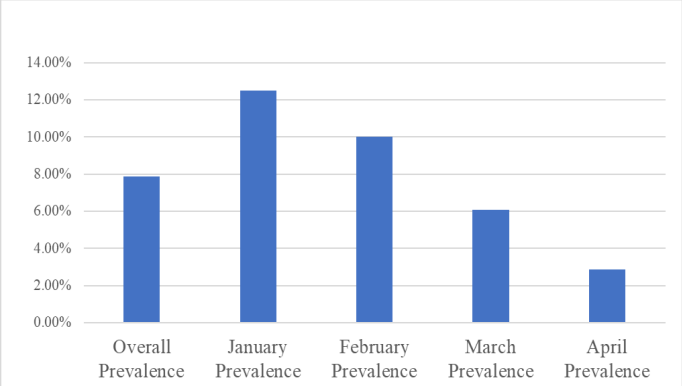

Figure 2: Monthly prevalence of bovine ephemeral fever (BEF) in cattle.

Table 2: Overall prevalence of bovine ephemeral fever (BEF) by different categories.

Category	Sub category	Total population	Positive cases	Prevalence (%)	Chi-square test	P value
Overall Prevalence		280	22	7.86%		
Age categories	<1 year	45	1	2.22%	3.22	0.36
	1-3years	118	12	10.17%		
	3-5years	54	3	5.56%		
	>5 years	63	6	9.52%		
Sex categories	Male	62	6	9.68%	0.303	0.582
	Female	218	16	7.34%		
Breed categories	Local	220	19	8.64%	0.748	0.387
	Cross	60	3	5%		

In Table 2, the prevalence of Bovine Ephemeral Fever (BEF) in cattle under various categories, with a total prevalence of 7.86% (22/280). The rates between and within age groups (2.22-10.17%), sexes (male 9.68% vs. female 7.34%), and breeds (local 8.64% vs. crossbred 5%), though not significantly different ($p > 0.05$).

As shown in Table 3, BEF had a prevalence of 12.5% (8/64) in January compared with the total prevalence of 7.86. The most prevalence was seen in cattle older than 5 years (23.53%), 1-3 years old (12.5%), and none in the calves under 1-year-old and cattle between 3-5 years old. Practical differences in prevalence by age, sex, and breed were not found to be significant ($p > 0.05$).

Table 3: BEF Prevalence in January by different categories.

Category	Sub category	Total population	Positive cases	Prevalence (%)	Chi-square test	P value
January prevalence		64	8	12.5%		
Age categories	<1 year	8	0	0%	3.52	0.318
	1-3years	32	4	12.5%		
	3-5years	7	0	0%		
	>5 years	17	4	23.53%		
Sex categories	Male	18	3	16.67%	0.044	0.834
	Female	46	5	10.87%		
Breed categories	Local	43	6	13.95%	0.0101	0.920
	Cross	21	2	9.52%		

Table 4: BEF prevalence in February by different categories.

Category	Sub category	Total population	Positive cases	Prevalence (%)	Chi Square test	P value
February prevalence		80	8	10%		
Age categories	<1 year	16	1	6.25%	1.79	0.617
	1-3years	36	5	13.89%		
	3-5years	10	0	0%		
	>5 years	18	2	11.11%		
Sex categories	Male	18	2	11.11%	0.028	0.866
	Female	62	6	9.68%		
Breed categories	Local	56	7	12.5%	1.17	0.279
	Cross	24	1	4.17%		

Table 4 reveals that in February, the prevalence of Bovine Ephemeral Fever (BEF) stood at 10% (8/80), which was marginally above the total prevalence of 7.86%. Cattle of age 1-3 years (13.89%), >5 years (11.11%), and <1 year (6.25%) showed the highest prevalence, with no cases recorded in the 3-5 years' age group. Variations in prevalence among age, sex, and breed were not statistically pronounced ($p > 0.05$).

Table 5 shows the prevalence of Bovine Ephemeral Fever (BEF) in March and the total prevalence was 6.06% (4/66), lower than the total prevalence of 7.86%. The highest prevalence was found in cattle aged 35 years (11.76%), then aged between 13 years (8.70%), and none in cattle older than 5 years and calves younger than 1 year. The prevalence differences by age, sex, and breed category were not significant ($p > 0.05$).

Table 6 illustrates the prevalence of the Bovine Ephemeral Fever (BEF) in April with a total prevalence of 2.86 (2/70), the least prevalence compared to the other four months.

The most prevalence was in cattle of the age 3-5 years (5%), 1-3 years (3.70%), and none in calves below 1 year of age or cattle older than 5 years. The age, sex, and breed differences in prevalence were not significant ($p > 0.05$).

Table 5: BEF prevalence in March by different categories.

Category	Sub category	Total population	Positive cases	Prevalence (%)	Chi-Square test	P value
March Prevalence		66	4	6.06%		
Age categories	<1 year	13	0	0%	2.75	0.432
	1-3years	23	2	8.70%		
	3-5years	17	2	11.76%		
	>5 years	13	0	0%		
Sex categories	Male	12	1	8.33%	0.115	0.734
	Female	54	3	5.56%		
Breed categories	Local	56	4	7.14%	0.705	0.401
	Cross	10	0	0%		

Table 6: BEF prevalence in April by different categories.

Category	Sub category	Total population	Positive cases	Prevalence (%)	Chi square test	P value
April prevalence		70	2	2.86%		
Age categories	<1 year	8	0	0%	1.04	0.791
	1-3years	27	1	3.70%		
	3-5years	20	1	5%		
	>5 years	15	0	0%		
Sex categories	Male	14	0	0%	0.496	0.481
	Female	56	2	3.57%		
Breed categories	Local	65	2	3.08%	0.153	0.696
	Cross	5	0	0%		

DISCUSSION

The present study focused on the monthly and categorical Bovine Ephemeral Fever (BEF) prevalence in cattle in Nageshwari Upazila, Kurigram District, Bangladesh. The overall prevalence during the four-month period from January to April, 2025 was 7.86%. In comparison, Nadeem *et al.* (2024) reported a higher seroprevalence of 18.33%. The overall highest rate of monthly prevalence in the current research was in January (12.50%), February (10%), March (6.06%), and April (2.86%) (Table 1 and Figure 2). That is comparatively lower than Liao *et al.* (1998) (13.6%) and higher than Hossain (2021) (4.54%). Such a decline indicates that there might be some seasonal factor affecting the disease transmission since the rates were higher in the cooler and probably more humid months, conditions that may suit the activities of these insect vectors that transmit BEF.

Age-wise categorization showed that age group 1-3 years of age recorded the highest overall prevalence (10.17%), age group over 5 years the second highest (9.52%), whereas calves with age of less than 1 year bore the lowest prevalence (2.22%) ($p = 0.36$) (Table 2). Similarly, Nadeem *et al.* (2024) detected the presence of BEFV in 20%, 96.97%, and 75% of cattle aged <1 year, 2-3 years, and >3 years, respectively ($P = 0.00001$). Based on sex-wise prevalence, it was observed that the overall prevalence in male cattle was slightly higher (9.68%) compared to female cattle (7.34%) ($p = 0.582$) (Table 2). This observation is contrary to that of Nadeem *et al.* (2024) who found females to have a higher seroprevalence (67.59%) than males (58.33%). This finding is consistent with the results of Zaghawa *et al.* (2016), who reported a significantly higher seropositive rate in males (24.4%) than in females (14.6%). Breed wise analysis indicated that there was a high prevalence of local breeds (4.64%) compared to crossbreeds (5%) ($p = 0.387$) (Table 2). This observation is inconsistent with the data of Nadeem *et al.* (2024) showing higher seroprevalence among crossbreeds (70%) in comparison with the local breed (45%). Although, indigenous cattle may be thought of as more resistant to the indigenous diseases, the high local frequency may indicate greater exposure based on less intensive management and housing of local breeds as compared to crossbred animals.

In January, the largest age-specific prevalence was apparent in cattle of >5 years (23.53%). The prevalence among the males (16.67%) was higher than that among the females (10.87%), whereas the local breeds (13.95%) were more prevalent than crossbreed (9.52%) (Table 3). In February, Cattle age 1-3 years had the greatest age-specific prevalence (13.89%), whereas none of the observations belonged to the 3-5 years age category. There was slight male (11.11%) prevalence compared to female (9.68%) with local breeds (12.5%) being affected more as compared to crossbreeds (4.17) (Table 4). In March, the highest age-specific prevalence was observed in the 3–5 years age group (11.76%), followed by the 1–3 years group (8.70%). No cases have been observed in the < 1 year and the > 5 years groups. The prevalence was slightly greater in males (8.33%) than females (5.56%) and local breeds (7.14%) were the only affected one (Table 5). In April, the highest age-specific prevalence was in the 3–5 years group (5%), followed by 1–3 years (3.70%), with no cases in <1 year or >5 years. Positive cases were confined to the females (3.57%) and all affected were local breeds (3.08%) (Table 6). But there were no significant differences ($P > 0.05$).

BEF is endemic and seasonally affected in the region, although its prevalence differed by age, sex, and breed but not significantly. A stronger focus on vector control, increased surveillance in summer months, and augmented studies on environmental and weather dynamics are

suggested to minimise the effects of the disease on livestock health.

CONCLUSIONS

BEF has been found to occur among cattle in the study area with an overall prevalence rate of 7.86%. The greatest prevalence was reported in the month of January, which should be a seasonal pattern. Though age, sex and breed exhibited some variation in terms of infection, no significant associations were observed. The results highlight the importance of strategic surveillance and vector control during seasons of the year when the risks of the disease are high in order to reduce its impacts.

Limitations

The study limitations are that the clinical and serological cases are not confirmed with a molecular test, the sample size used in stratified analysis is not very large and the study takes into consideration a single upazila which may not be generalizable. Nonetheless, this study contributes valuable baseline data on BEF epidemiology in northern Bangladesh.

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NOVELTY STATEMENT

This study provides the first baseline report on the prevalence and associated risk factors of BEF in cattle in Nageshwari Upazila, Kurigram, Bangladesh. The findings highlight the seasonal occurrence of BEF and offer essential epidemiological data to support future disease surveillance and control strategies.

AUTHOR'S CONTRIBUTION

Data collection: MKA, MAAM. Data analysis: MKA, MAAM. Writing the original draft: MKA, MIH. Review and editing: MKA. All authors read and approved the final manuscript.

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Generative AI and AI-assisted technology statement

The authors declare that no generative AI tools were used for data collection, analysis, or conclusions in this paper. AI was used only for improving language and grammar. The authors take full responsibility for the content of the article.

Conflict of interest

The authors have declared no conflict of interest.

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