



Research Article

Epidemiological Evidences of Foot and Mouth Disease (FMD) and Haemorrhagic Septicaemia (HS) of Buffalo in Sylhet Region of Bangladesh Based on Hospital Register Data

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Abstract | The study was conducted to ascertain the hospital prevalence of buffalo diseases and to determine the temporal distribution of important infectious diseases of buffalo like as Foot and Mouth Disease (FMD) and Haemorrhagic Septicaemia (HS) at Upazila veterinary hospitals of Jaintapur, Gowainghat and Kanaighat upazilas of Sylhet district. From October, 2015 to September, 2017 a total of 1057 cases of buffalo diseases were recorded in the hospital record books. Among all diseases, the overall hospital prevalence of Helminthiasis in buffalo was highest (22.32%) followed by FMD (20.71%; 95% CI: 18.38%-23.27%) and HS (10.78%; 95% CI: 9.06%-12.80%). Prevalence of FMD was found significantly higher in Jaintapur (26.75%) than rest two Upazilas. Highest prevalence of FMD (36.08%) was observed at young animal (above 2-4 years) followed by Adults (15.10%) and calf (5.60%). Epidemic curves using the information of weekly occurrence of FMD showed consistent occurrence of this disease round the year with peaks during winter season. Similar analysis was also done for HS and like FMD, highest prevalence (16.14%) found in Jaintapur upazila. HS prevalence also found significantly higher in young buffalos (18.56%). HS prevalence was significantly higher in male (12.73%) than female. Epidemic curves of HS showed a clear year round occurrence with peaks in summer season. Though, estimates could not expressed real disease burden because of using information of hospital register, outcome of this report provided some hints of burden and identified some potential factors and temporal trend of FMD and HS in buffalos of selected upazilas of Sylhet.

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Introduction

Buffalo (*Bubalus bubalis*) is one of the most important livestock species distributed worldwide specially in tropical and sub-tropical countries (Das and Khan, 2010). Not only for providing better quality

milk, but also for quality meat and draught purpose use; now-a-days buffalo raising become popular. The global buffalo population is estimated to be approximately 194.29 million over 42 countries (Hamid et al., 2016) and buffalo in Asia dominate the world population, representing 92.52% (179.75 million)

of the total buffalo population (FAO, 2012). Within the Asian region, about 79.74% of buffaloes are in South Asian countries and the rest 20.26% in other countries. India and Pakistan are the two buffalo rich countries in the world that contributes 58.11% and 16.83% of world buffalo population, respectively (FAO, 2012). In Bangladesh, the farmers especially from hilly areas, river basins and low lying marshy lands are more dependent on buffaloes than cattle. As estimated, there are 445,000 buffaloes spreading over Bangladesh which mainly depend on grass and small quantities of agricultural wastes (Saadullah, 2012).

Buffalo provides major contribution after cattle to livestock sector more especially to the rural economy of Bangladesh (Saadullah, 2012). Generally buffalo is regarded as more productive and more useful than the cow, especially for the poorest “backyard” farmers (Rajput et al., 2005). Though buffaloes serve milk, meat and supply draught power and play a very important role in overall livestock economy of Bangladesh (Ghaffar et al., 1991), research on buffalo in comparison to cattle has been much neglected. The Food and Agriculture Organization (FAO, 2000) has rightly termed buffalo as ‘an asset undervalued’.

Moreover, research especially on buffalo diseases is surprisingly scarce in Bangladesh. Buffalo diseases have been identified as one of the major factor which have disrupted the overall development of the industry in Asia and have caused substantial economic loss to the poor subsistent farmers in the developing countries.

Like other developing countries, buffalo production systems and its use vary widely in different areas of Bangladesh according to its geography, climatic and socio-economic condition (Saadullah, 2012). In Sylhet, Most of them are reared with other livestock population with no or minimal inputs and mostly maintained under scavenging systems.

So that different infectious diseases spread more rapidly in buffalo. Moreover, most of the owners are unaware about this spreading and thus buffalo suffer from many diseases, which reduce the performance of them as well as cause huge economical loss of the farmer. But, no systemic work has been documented till date on buffalo diseases and their management in Bangladesh. At the same time, epidemiological scenario of Buffalo diseases at Sylhet region has not been

fully analyzed. These kinds of information might be valuable for realizing the economic importance as well as epidemiology of Buffalo diseases and disorders. Considering the above fact, the objectives of the present study was to find out the clinical prevalence of Buffalo diseases to understand the disease burden and to determine the temporal distribution of important buffalo infectious diseases like Foot and Mouth Disease (FMD) and Hemorrhagic Septicemia (HS) in selected upazilas at Sylhet region.

Materials and Methods

This study was based on the information collected from secondary sources in a retrospective view. The data were collected passively from the patient registers of Upazila Veterinary Hospital of Jaintapur, Kanaighat and Gowainghat, Sylhet. Cases of buffalo diseases recorded in patient registers for a period of two years started from October, 2015 to September, 2017 are entered into Excel spread sheet.

After scrutiny, information about 1057 diseased buffalo were listed in the spread sheet and used for the analysis in this study. Patient registers of these three veterinary hospitals enlisted only few information of each buffalo like age, sex, date of treatment, owners complain and diagnosis and treatment. Thus, only few variables like age, sex, season, Upazila were used in the analysis.

After collection of all these data, descriptive analyses were performed. Some variables like age of animal and date of diagnosis/reporting were categorized for convenient. Age was categorized into three group namely ‘upto two years’ (calf), ‘Above two years to four years’ (young) and ‘Above four years’ (Adult) and variable season was created using the reporting date of the patient. After manipulation of these variables, prevalence of buffalo diseases were estimated by using the following equation:

$$\text{Prevalence (\%)} = (\text{Number of affected buffaloes at a given time} / \text{Total number of patient attended}) \times 100$$

Study population of this study did not represent the true buffalo population of the selected upazilas. Hence, prevalences reported in this report might overestimate the prevalence of buffalo diseases. Thus, henceforth prevalence estimates of this report will be considered as hospital prevalence. After estimation

of prevalence of buffalo diseases, two important infectious diseases namely FMD and HS were selected based on their prevalence and data were analyzed further for identifying epidemiological parameters of these diseases. Variations of prevalences of two selected diseases among different age groups, seasons, sex and upazilas were assessed by chi-square tests and statistical significances of these variations were evaluated. Variations obtained p value <0.05 were considered as cut off value for this test.

For assessing the overall temporal trend of FMD in the selected areas, epidemic curves were constructed by plotting the weekly recorded number of FMD cases in the study against the occurring weeks. Similar temporal trend for HS was constructed to see the variations in temporal trends in relation to seasons.

Results

The study was conducted among the naturally infected buffaloes that were brought to the selective three (Jaintapur, Kanaighat and Gowainghat) Upazila Veterinary Hospitals, Sylhet from October 2015 to September 2017. A total of 1057 diseased buffaloes data were recorded among which, 415 (39.26%) were recorded from Jaintapur and rest 322 (30.47%) and 320 (30.27%) from Kanaighat and Gowainghat upazila respectively. Total 589 (%) male and 468 (%) female buffaloes were counted for different diseases within this period. Total 232 buffalo were counted for 'upto two years' age group, 388 and 437 were recorded for 'Above two years to four years' and 'Above four years' age group, respectively. A total of 338 (31.98%) cases were recorded in winter season, whereas 364 (34.44%) and 355 (33.59%) cases were recorded in summer and rainy seasons, respectively (Table 1).

Overall disease status

In Table 2, prevalences of different buffalo diseases with 95% confidence interval (95% CI) were presented. The prevalence of helminthiasis was the highest (22.32%; 95% CI: 19.92% - 24.94%). Prevalences of other economically important disease like FMD and HS were 20.71% and 10.78%, respectively. Prevalence of Bovine epimeral fever, Black quarter, Corneal opacity, Foot rot, Wart were recorded 3.78%, 2.36%, 4.16%, 1.22% and 0.94%, respectively. Among the reported infectious diseases, FMD and HS data were further analyzed due to their higher estimated prevalences.

Table 1: Distribution of cases of buffalo diseases recorded in selected upazila veterinary hospitals of Sylhet district from October, 2015 to September, 2017.

Criteria	No of animal	Proportion (%)
Overall	1057	100
Upazilla		
Jaintapur	415	39.26
Kanaighat	322	30.47
Gowainghat	320	30.27
Sex		
Male	589	55.72
Female	468	44.28
Age group		
Upto 2 years	232	21.95
Above 2 - 4 years	388	36.71
Above 4 years	437	41.34
Season		
Winter(Nov-Feb)	338	31.98
Summer(Mar-June)	364	34.44
Rainy(July-Oct)	355	33.59

Foot and mouth disease

Within the recorded disease cases, 219 buffaloes were tentatively diagnosed as FMD infected, hence, the overall hospital prevalence of FMD was estimated 20.71% (95% CI: 18.38-23.27%). It was observed that prevalence varied significantly (p<0.01) among veterinary hospitals with highest prevalence was observed in Jaintapur (26.75%) followed by Gowainghat (17.50%) and Kanaighat (16.15%). Sex wise variation of FMD occurrence in buffalo was statistically insignificant (p=0.36) (Table 3). Significant variation of hospital prevalence of FMD was also observed in different age group animals (p< 0.01). Highest prevalence of FMD (36.08%) was observed in 'Above two years to four years' age group and lowest prevalence (5.60%) in 'upto two years' age group buffaloes. Estimated prevalence in rainy seasons was 20.56% followed by 20.71% in winter and 20.87% in summer. Variations among these seasons were show statistically insignificant (P-value = 0.99).

The constructed epidemic curve of FMD using the records of these three veterinary hospitals presented in Figure 1 showed clear year round occurrence of FMD, however, no distinct peaks were observed. A peak was observed in October 2105 to February 2016 and another one started from September 2016 to November 2016 during the study period indicating winter season as the most vulnerable time for

Table 2: Hospital prevalence of overall buffalo diseases found in selected upazila veterinary hospitals, Sylhet from October, 2015 to September, 2017.

Disease name	Number of diseased animal	Prevalence (%)	95% Confidence Interval (95%CI)
Foot and Mouth Disease	219	20.71	18.38-23.27
Haemorrhagic Septicaemia	114	10.78	9.06-12.80
Black Quarter	25	2.36	1.61-3.47
Bovine Epimeral Fever	40	3.78	2.79-5.11
Corneal Opacity	44	4.16	3.12-5.54
Foot Rot	13	1.22	0.72-2.09
Wart	10	0.94	0.51-1.73
Helminthiasis	236	22.32	19.92-24.94
Others*	356	33.49	30.89-36.58
Total	1057		

Others* =Alopecia, Arthritis, Bloat, Calf pneumonia, Colic, Diarrhoea, Humpsore

Table 3: Hospital prevalence of Foot and Mouth Disease of buffalo recorded in selected upazila veterinary hospitals, Sylhet district from October, 2015 to September, 2017.

Criteria	No of animal examined	No of FMD affected	Prevalence (%)	95% Confidence Interval (%)	P-Value
Overall disease	1057	219	20.71	18.38-23.27	
Upazila					
Jaintapur	415	111	26.75	22.72-31.20	<0.01
Kanaighat	322	52	16.15	12.53-20.56	
Gowainghat	320	56	17.50	13.73-22.04	
Sex					
Male	589	128	21.73	18.39-25.07	0.36
Female	468	91	19.44	15.84-23.04	
Age group					
Upto 2 years	232	13	5.60	2.62-8.58	<0.01
Above 2 - 4 years	388	140	36.08	31.28-40.88	
Above 4 years	437	66	15.10	11.73-18.47	
Season					
Winter (Nov-Feb)	338	70	20.71	16.36-25.05	0.99
Summer (Mar-June)	364	76	20.87	16.68-25.07	
Rainy (July-Oct)	355	73	20.56	16.33-24.78	

FMD occurrence. However, in 2016 FMD cases were recorded considerably at higher rate round the year. Upazila specific epidemic curves showed that in Jaintapur upazila FMD occurred all-round the year however, a peak was extended from October 2015 to January 2016 (Data not shown). Similarly, year-round occurrence of FMD was observed in other two upazilas, but no distinct peak was observed.

Haemorrhagic Septicaemia (HS)

Within the study population, 114 buffaloes were tentatively diagnosed as HS infected, hence, the overall

hospital prevalence was estimated 10.69% with 95% confidence interval (8.98%-12.69%) (Table 4). Prevalence of HS in different upazilas varied significantly in chi-square test ($p < 0.0001$) where the highest prevalence was observed in Jaintapur (16.14%; 95% CI 12.92%-19.99%) followed by Gowainghat (7.81%; 95% CI 5.35%-11.28%) and Kanaighat (6.83%; 95% CI 4.55-10.13%). Statistically significant ($p < 0.02$) variation of hospital prevalence of HS was observed in different sex of animals. Higher prevalence of HS (12.73%) was observed in male than in female buffaloes (8.33%). Variation of prevalence of HS among

different aged group animals showed significant ($p < 0.01$) differences. Lowest prevalence (3.88%) observed in 'upto two years' age group and highest prevalence (18.56%) was estimated from 'Above two years to four years' age group buffaloes. Variable season was also found statistically significant ($p < 0.01$). Highest prevalence of HS (17.31%) recorded in summer season and lowest prevalence (7.10%) was estimated in winter season (Table 4).

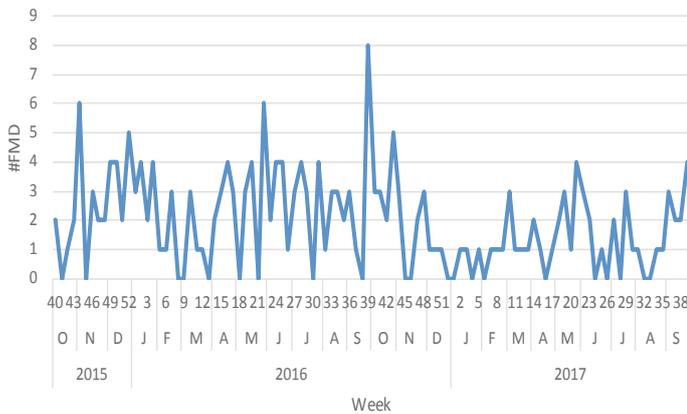


Figure 1: Epidemic curve constructed from weekly occurrence of Foot and Mouth Disease cases recorded in selected upazilas under Sylhet district during two-year study period.

The constructed epidemic curve of HS using the records of these three veterinary hospitals presented in Figure 2 showed clear year round occurrence of HS.

A clear peak was observed between May 2106 to July 2016, which corresponded to the summer season. In accordance with overall trend analysis, a peak in summer 2016 was observed Jaintapur, however, no such peak was identified in Kanighat and Gowainghat upazilas (Data not shown).

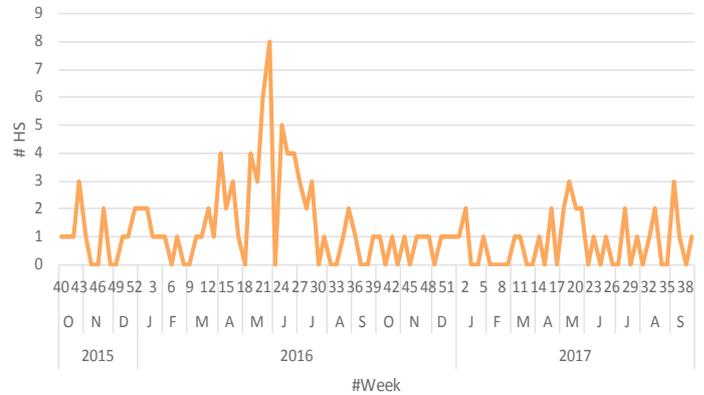


Figure 2: Epidemic curve constructed from weekly occurrence of Haemorrhagic Septicaemia cases recorded in selected upazilas under Sylhet district during two-year study period.

Discussion

Like other parts of the country, buffalo diseases are also highly prevail in Sylhet region. This report aimed to describe the hospital prevalence of buffalo diseases in three selected upazilas of Sylhet district. As

Table 4: Hospital prevalence of Haemorrhagic Septicaemia of buffalo in selected upazila veterinary hospitals, Sylhet district from October, 2015 to September, 2017.

Criteria	No of animal examined	No of HS affected	Prevalence (%)	95% Confidence Interval (%)	P-Value
Overall disease	1057	114	10.78	8.98-12.69	
Upazila					
Jaintapur	415	67	16.14	12.92-19.99	<0.01
Kanaighat	322	22	6.83	4.55-10.13	
Gowainghat	320	25	7.81	5.35-11.28	
Sex					
Male	589	75	12.73	10.03-15.43	0.02
Female	468	39	8.33	5.82-10.84	
Age group					
Upto 2 years	232	9	3.88	1.37-6.38	<0.01
Above 2 - 4 years	388	72	18.56	14.67-22.44	
Above 4 years	437	33	7.55	5.06-10.03	
Season					
Winter (Nov-Feb)	338	24	7.10	4.34-9.85	<0.01
Summer (Mar-June)	364	63	17.31	13.40-21.21	
Rainy(July-Oct)	355	27	7.61	4.83-10.37	

information from hospital patient registers were used, the estimates provided in this report could be an over estimation of the real status of buffalo diseases of these selected areas, thus, should be generalized with cautions. In addition, an attempt was made to describe the temporal distribution of important infectious diseases like FMD and HS through constructing epidemic curves using the information of number of weekly reporting cases for a two-year period. Such curves would identify the time when occurrence of these diseases seems to be higher than the other seasons and these information could be used for taking necessary measures for reducing the disease burden.

There are many infectious diseases and disorders which affect the performance of buffalo in Sylhet region. Among them FMD, HS, BQ, Foot rot and parasitic infestation are mainly responsible for declining the performance of buffalos. This report describes that all these above mentioned diseases were prevalent in buffalo population of these selected upazilas, of which, prevalence of parasitic infestation was the highest (22.32%). This result somehow coincided with the findings with studies of Islam et al. (2016) who also recorded highest prevalence for helminthiasis (32.34%) in all over the Bangladesh. Among the infectious diseases FMD had the highest prevalence followed by HS.

This report revealed 20.71% hospital prevalence of FMD in buffalos at selected upazilas in Sylhet district. No such report has yet been documented so far, hence, could not be compared. However, this finding agree with previous reports on cattle, who recorded 16.92% (Alam et al., 2016) and 17.46% (Maruf et al., 2016) FMD prevalence for cattle from Jaintapur and Kulaura upazila of Sylhet division. It was observed that prevalence was significantly higher in Jaintapur (26.75%) than Gowainghat (17.50%) and Kanaighat (16.15%). This result indicated the spatial variation in the occurrences of FMD in Jaintapur upazila with both Kanaighat and Gowainghat upazila. However, the exact cause(s) of this variation could not be identified from this kind of study relayed on information of hospital patient registers. There was a renowned animal market found in Jaitapur upazila. As a result, transportation and gathering of animal as well as illegal cross-border entry of cattle and buffalos were more frequently reported in Jaintapur than other two upazilas. This might play a role on having higher prevalence in Jaintapur. Moreover, density of buffalo

population is relatively higher in Jaintapur than other selected upazila; might also be a cause for higher prevalence. It was observed that occurrence of FMD was insignificantly higher in male (21.73%) than female animal (19.44%). Male animal faced more stress than female as they were mainly used for draught purpose. Moreover, movement of male buffalos for draught use might have higher chance of having contact with infected animals or environment.

Reported overall prevalence of FMD was significantly higher in young buffaloes than adults and calves. Current study shows that calves are less susceptible to FMD in compare to young and adults. This might be due to they have maternally derived antibody persist in their body before they attained age of weaning period. Young buffalos need additional nutritional supplement for their sexual maturity and body weight gain. The increased susceptibility of young buffaloes was might be due to malnutrition, poor immunity and poor management systems. Moreover, young buffaloes got first experience in draught purpose. As a result, they are suffered from long term malnutrition as well as huge works load which prone to disease susceptibility.

Analysis of the epidemiological data reveals that although the disease FMD in Bangladesh maintains its existence endemically all-round the year but abrupt weather changes like sudden rise of temperature, long draught, and increased movement of animals during festivals and introduction of newly purchased animals from the market influenced the start of an epidemic. The present study showed insignificantly higher prevalence of FMD in summer (20.87%) compared to winter season (20.71%) and rainy season (20.56%). Alam et al. (2016) also reported higher prevalence of FMD at summer season.

By analysis of overall and upazila specific temporal distribution it could be stated that cases of FMD occurs round the year, thus provide an evidence of endemic nature of the disease. Grubman and Baxt (2004) stated that FMD is endemic in tropical environment which persist in present study area. Although endemic, extent of occurrence varies greatly with the seasons. This statement was supported by the findings of temporal trend analysis of this present study. The epidemic curves showed although reported round the year, no clear peaks were observed. A peak was observed in October 2105 to February 2016 and

another one started from October 2016 to November 2017 during the study period indicating winter season as the most vulnerable time for FMD occurrence. However, in 2016 FMD cases were recorded considerable at higher rate round the year. In case of Jaintapur temporal curves was similar to overall temporal curve of Sylhet district. But differences were found in Kanaighat and Gowainghat upazilas.

This report transpired 10.78% hospital prevalence of HS in buffalos at selected upazila in Sylhet district. Islam et al. (2016) reported that prevalence of buffalo HS in Bangladesh was 17.73%, which was relatively similar to the findings of this report.

It was observed that prevalence was significantly higher in Jaintapur upazila (16.14%) than Gowainghat upazila (7.81%) and Kanaighat upazila (6.83%). It appeared that the prevalence of HS in both Kanaighat and Gowainghat upazila were more or less similar but in case of Jaintapur upazila the prevalence was significantly higher. HS occurrence is significantly higher in male animal and reason behind such occurrence would be as similar as described in FMD section.

Reported overall prevalence of HS was significantly higher in young buffaloes than adults and calves. The calves are less susceptible to HS than young and adults. The increased susceptibility of young buffaloes was might be due to malnutrition, poor immunity, excess work load, transportation stress etc.

Analysis of the epidemiological data reveals that although the disease in Bangladesh maintains its existence endemically all-round the year but abrupt weather changes like sudden rise of temperature, long draught, and increased movement of animals during festivals and introduction of newly purchased animals from the market influenced the start of an epidemic. New entry of buffaloes into a farm is the most important factor for spreading this disease both in rural as well as in the urban areas. The present study showed significantly high prevalence of HS in summer season (17.31%) compared to rainy season (7.61%) and winter season (7.10%).

By analysis of overall and Upazila specific temporal distribution of HS, it could be stated that, cases of HS occurs round the year, thus provide an evidence of endemic nature of the disease. Although endemic, extent of occurrence varies greatly with the seasons.

This statement was supported by the findings of temporal trend analysis of this present study. The epidemic curves showed although reported round the year, there was no distinct peak observed in particular time period of the year in total study time. A huge peak found from March to July in 2016 but no such peak found in 2017. This change may be due to the change of weather in relation time. Temporal trend of Jaintapur upazila was similar to overall temporal trend of HS. In case of Kanaighat and Gowainghat there was no distinct peak found in 2017.'

Conclusions

The present study provided important epidemiological data about the clinical prevalence of buffalo diseases in selective areas of Sylhet region. FMD and HS were identified as the most important infectious diseases in buffaloes. Study showed that age of animal, sex, season and geographical distribution have influence in both FMD and HS occurrence. Consistent temporal trends for FMD and HS were identified in the selected region of Sylhet. So it is a concerning matter for the farmers in these areas. Though cannot be generalized, but this result can still be used for planning and implementing control measures for both diseases. It is recommended that campaign should be arranged to increase the awareness of farmers about the disease epidemiology and suggest them to vaccinate their animals for proper immunization against the FMD and HS every year.

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Authors' Contributions

Abdul Majid Ujjal conceived the study, collected data and wrote the manuscript; Sharmin Akter helps in analysis of collected data and interpretation of results, formatted the manuscript and arranged references and Suman Paul supervise the work.

Conflict of Interest

There is no conflict of interests regarding the publication of this article.

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