



Short Communication

Clinical Investigation of Foot and Mouth Disease of Cattle in Batiaghata Upazilla Veterinary Hospital, Bangladesh

KM Fakhurul-Islam^{1*}, Mohammad Shah Jalal², Sonnet Podder³, Md Nurul Quader⁴, Md Sahidur-Rahman⁵, Avijit Dutta⁶ and Shuvo Mazumder⁷

¹Department of Physiology, Biochemistry and Pharmacology; ²Department of Microbiology and Veterinary Public Health; ³Department of Anatomy and Histology; ⁴Department of Physiology, Biochemistry and Pharmacology; ⁵Department of Microbiology and Veterinary Public Health; ⁶Department of Microbiology and Public Health, Chittagong Veterinary and Animal Sciences University, Bangladesh; ⁷Bangladesh Agricultural University, Bangladesh.

Abstract | Foot and mouth disease (FMD) is an epitheliotropic and transboundary viral disease affecting cattle, buffalo, sheep, goats, and wild animals around the globe. This highly contagious disease causes severe economic loss due to reduced productivity of the affected animals as well as increased mortality in calves and kids. In this study proportionate prevalence of FMD in cattle was estimated and the distribution of FMD according to different factors was evaluated. Both retrospective and prospective FMD clinical cases were included considering clinical signs and drugs used for treatment during 13 January to 15 March 2015. A total of 131 cattle was investigated and 16.8% cattle were recorded as FMD. The proportionate prevalence of FMD in different study areas were 4.5-18.2%. The occurrence of FMD was higher in February (23.3%) than in January (13.5%) and March (18.5%). Younger cattle were more commonly affected (59.1%) than older ones. Almost 96% of the female cattle were FMD positive. Cattle with poor body condition score had higher FMD cases (77.3%) than cattle with better body condition score. The lactating animals and pregnant animals were more commonly affected (81.8% and 63.6%), respectively. The main clinical signs were high fever (100%), sore foot (72.7%) and sores mouth (63.6%). The category of 16-20 days of illness of FMD was recorded for 36.5% cases. The treatment given was sulphonamide or amoxicillin along with other supportive drugs. The recovery rate was 60-80%.

Editor | Muhammad Abubakar, National Veterinary Laboratories, Park Road, Islamabad, Pakistan.

Received | September 11, 2016; **Accepted** | November 17, 2016; **Published** | December 07, 2016

***Correspondence** | KM Fakhurul-Islam, MS fellow, Department of Physiology, Biochemistry and Pharmacology, Chittagong Veterinary and Animal Sciences University, Bangladesh; **Email:** fakhruiddvm15@gmail.com

Citation | Fakhurul-Islam, K.M., M.S. Jalal, S. Podder, M.N. Quader, M. Sahidur-Rahman, A. Dutta and S. Mazumder. 2017. Clinical investigation of foot and mouth disease of cattle in Batiaghata Upazilla veterinary hospital, Bangladesh. *Veterinary Sciences: Research and Reviews*, 2(3): 76-81.

DOI | <http://dx.doi.org/10.17582/journal.vsr/2016.2.3.76.81>

Foot and Mouth Disease (FMD) is caused by an Aphthovirus belonging to the family Picornaviridae and is a transboundary viral disease responsible for significant global economic losses of livestock production and trade. The disease is characterized by high fever (104-106°F), epithelial erosions on the tongue and in the inner mouth that lead to excessive salivation, and lesions on the foot that cause lameness. The disease affects cloven footed animals such as cattle, buffalo, sheep, and goats (Blood et al., 1989).

FMD virus has seven immunologically distinct serotypes: A, O, C, SAT-1, SAT-2, SAT-3, and Asia-1. In Bangladesh, serotypes O, A, C and Asia-1 have been circulating and are considered endemic in cattle (Islam et al., 1985). Immunity of one strain cannot provide protection against other strains (Chowdhury et al., 1994). FMD is most stable between a pH of 7.4 and 7.6 and is rapidly destroyed by changes in the pH outside this range (Fraser, 1991). It survives below 4°C and may be stored for many years under freezing tem-

peratures. Most FMD field strains are inactivated by 56°C temperature for 30 minutes (Loeffler and Frosch, 1997). This virus enters the body by inhalation or ingestion. The virus passes to the blood stream and goes to the predilection sites. In favourable conditions the virus multiplies in different tissues. After replication the virus forms primary vesicles within 1 to 4 days and viremia with fever is seen 2 days later. Secondary vesicles appear on stratified squamous epithelium like gum, the dental pad, and the interdigital cleft (Fraser, 1991). The virus passes to the blood stream and goes to the predilection sites. In favourable conditions the virus multiplies and produces a viremia. Virus then sheds out from the respiratory tract and feces, urine, semen, saliva and milk (Forman, 1974).

Bangladesh is an agro-economy based country. About 70% of its population are directly or indirectly associated with agriculture and livestock production. FMD seriously impacts the dairy industry in this country due to loss of milk production and increased rates of abortion (Chowdhury et al., 1994; Loeffler and Frosch, 1997). This disease is considered endemic in cattle in Bangladesh, although seasonal epidemics are also recognized (winter and rainy seasons) (Chakrabarty et al., 1979).

In Bangladesh the prevalence of FMD was reported to be 46-55% in cattle (Hyslop, 1970), 20-32% in buffalo (Gangopadhyay et al., 1990), and 9-18% in goat (Kamruddin and Pandit, 1988). Potential risk factors associated with FMD in different livestock species are breed, age, season, environment and farm management practices (Blackwell, 1980; Chowdhury et al., 1994). Cross bred animals are more frequently affected than indigenous breeds (Chowdhury et al., 1993). Young animals are affected more than adults (Falconer, 1972). Environmental factors, such as temperature (20-34°C) and humidity (50-60%), and farm management factors, such as maintaining closed herd and maintaining proper biosecurity, are also potentially associated with increased occurrence of FMD (Plotnikov, 1972; Radostits and Hinchclif, 2007). The consequences of FMD in any species are reduced milk production, abortion, and mortality of 50-100% in calves and kits (Hussain and Sarker, 1978; Kamruddin and Pandit, 1988).

No specific treatment is available for FMD affected animals. Supportive care such as the use of antimicrobial therapy and antiseptics, including potassium perman-

ganate and glycerin, has been suggested to improve the healing of lesions (Hussain and Sarker, 1978).

FMD can be controlled by the use of a vaccination programme. Commonly used local vaccines against FMD produced by Livestock Research Institute, Mohakhali, Dhaka, Bangladesh include the monovalent vaccine (strain A) which is injected at 3 ml intramuscularly for four month animal, the bivalent vaccine (strains A and O) which is injected at 6 ml intramuscularly for the animal, and the trivalent vaccine (strains A, O and Asia-1) which is injected at 9 ml intramuscularly for animal (BLRI, 2015, personal communication). Booster doses should be maintained at 4-6 months interval afterwards (Fraser, 1991). Strong biosecurity measures like prevention of entry of foreign materials, isolation of infected animals, and quarantine of new animals will help control the disease (Chowdhury et al., 1993). Proper farm hygiene including washing the manager, gutter, feeding materials, and litter as well as the use of footbaths will also prevent the occurrence of FMD (Radostits and Hinchclif, 2007).

The present study was conducted at Batiaghata, Upazilla Veterinary Hospital (UVH), Khulna, Bangladesh having estimated livestock population 5000. With a view to estimate proportionate prevalence of FMD in cattle, categorize the FMD according to unions, age and sex of cattle along with frequency of clinical signs and duration of illness as well as drugs used against FMD cases in cattle.

Materials and Methods

Investigation of clinical FMD in cattle was conducted at Batiaghata Upazilla, Khulna from 13 January to 15 March, 2015 that were registered at UVH as well as treated at different household and commercial farms. Cases of FMD were diagnosed according to recorded clinical signs and clinical history after physical examination and interviewing farmers. Data recorded for each animal included animal demography (age, sex, and breed), body condition score, lactation status, and pregnancy status, and rectal temperature, date of case occurrence, clinical signs, and treatment. Body condition score was assessed by examination of ribs, hind quarters, fore quarters, pin bones, thigh muscles, and hip joints as per published description (Sil et al., 1995). Clinical cases other than FMD were also recorded to calculate the proportionate prevalence of FMD. Vesicular stomatitis, rabies, and foot rot also

exhibit FMD like clinical signs and lesions (Blood et al., 1989). Therefore, FMD was differentiated from other diseases by looking at pathognomonic clinical signs and lesions. Vesicular stomatitis only produces oral lesions; rabies shall have dog bite history and frenzy or drowsiness; Foot rot does not have oral lesions but vesicle formation in the interdigital cleft is seen (Leslie et al., 1998). Data obtained were entered into Microsoft Excel 2010 and then transferred to STATA-13 (Stata Crop, 4905, Lakeway River, College Station, Texas 77845, USA) for analysis. Descriptive analysis was performed. Results were expressed as frequency and percentage against each category of variable and clinical sign.

Results

Overall Proportionate Prevalence of FMD and its Temporal Distribution in Cattle

The overall proportionate prevalence of clinical FMD in cattle was 16.8 % (N=131). The estimated proportionate prevalence of clinical FMD in cattle was 13.5% in January, 23.3% in February, and 18.5% in March (Table 1).

Table 1: Proportionate prevalence of FMD in cattle at Batiaghata according to months (N=22)

Month	No. of cases	No. of FMD cases	% of cases
January	74	10	13.5%
February	30	7	23.3%
March	27	5	18.5%
Total	131	22	55.3%

Occurrence of FMD in Cattle according to Different Factors

Younger cattle were more commonly affected than older cattle (13 versus 9 cases). Almost 96% of female cattle had FMD. Cattle with poor body condition scores (BCS of 3) were more likely to be infected when compared to cattle with better body condition scores (BCS of 4-5) (17 versus 5 cases). Lactating cattle had more cases than non-lactating cattle (18 versus 4 cases). Pregnant cattle were frequently affected by FMD as compared to non-pregnant cattle (14 versus 8 cases) (Table 2).

Clinical Signs along with Duration of Illness of FMD Cases in Cattle

100% of FMD cases presented with a high fever (104-106°F). Other common clinical signs and le-

sions encountered in FMD cases were frothy salivation (81.8%), sored foot (72.7%), and sored tongue (63.6%) (Table 3; Figure 1.B).

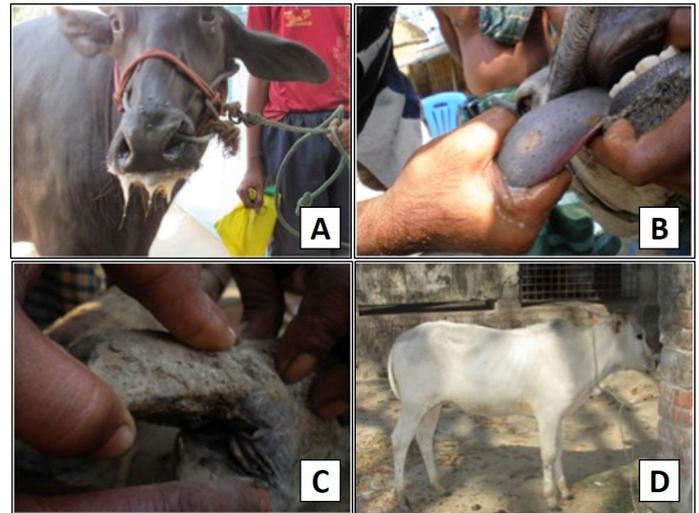


Figure 1: Cardinal sign of FMD

Table 2: Distribution of FMD cases in cattle according to different factors

Factors	Categories	Frequency numbers	% of cases
Unions	Alamdanga	1	4.5%
	Baliadanga	1	4.6%
	Vangarpul	1	4.6%
	Surkhali	3	13.6%
	Gangarampur	4	18.2%
	Batiaghata sadar	4	18.2%
	Chakrakhali	4	18.2%
	Jalma	4	4.6%
	Age (Year)	< 3	13
3.1 to 4		9	40.9%
Sex	Male	1	4.6%
	Female	21	95.5%
Body Condition Score	3	17	77.3%
	4	3	13.6%
	5	2	9.1%
Lactation	Yes	18	81.8%
	No	4	18.2%
Pregnancy	Yes	14	63.6%
	No	8	36.4%

Table 3: Frequency of clinical signs of FMD cases in cattle registered at Batiaghata UVH (N=22)

Classes of signs	No of animals showing clinical signs	%
Fever (104-106°F)	22	100%
Frothy salivation	18	81.8%
Sored foot	16	72.7%
Sored tongue	14	63.6%
Flea in foot region	1	4.6%

Lack of appetite, anorexia, loss of milk production, hoof deformities, and lameness were common clinical signs for most of the studied animals. Duration of illness encountered in FMD cases was 3-5 days (9% cases), 6-10 days (31.8%), 11-15 days (22.7%) and 16-20 days (36.5% cases) (Table 4).

Table 4: Frequency distribution of duration of illness of FMD cases in cattle

Duration of illness (Days)	Frequency numbers	%
3-5	2	9%
6-10	7	31.8%
11-15	5	22.7%
16-20	8	36.5%

Drugs Used to Treat Clinical FMD Cases in Cattle

Different drug combinations were prescribed for the treatment of clinical FMD cases. The most common combination of drugs was sulphonamide combined with glutamic acid (apthocare) and metamisol (45.5%), followed by amoxicillin along with glycerin and boric acid (22.7%), amoxicillin along with natrycarbone (FMD cure) and metamisol (18.2%) and sulphonamide along with glycerin and boric acid (13.6%). The recovery rate was 60-80% (Table 5).

Discussion

Foot and Mouth Disease is an acute, extremely contagious, and highly communicable viral disease of all cloven hooved animals. The overall proportionate prevalence of 16.8% in this study corresponds to earlier studies such as 17.3% in Mymensingh (Chowdhury et al., 1994), 19.2% in Gaibandha (Islam et al., 1985), and 21% in Manikgonj (Rahman et al., 1989). The occurrence of FMD was higher in February than any

other month in this study which is similar to previous studies (Plotkinov, 1972; Chakrabarty et al., 1979). Previous studies found a proportionate prevalence of 26% FMD in summer (April-June), 43% in the rainy season (July-September), 52% in winter (October-January), and 47% in autumn (February-March) (Chowdhury et al., 1994). The finding that the proportionate prevalence of FMD was higher in younger compared to older cattle is in agreement with the findings of other researchers (Hyslop et al., 1970; Sil et al., 1998).

The present study also identified that female cattle were commonly affected by FMD, which is similar to a previous study by Hussain and Sarker (1978). Cattle with a poor body condition score had more FMD cases in this study, which was also observed by Fraser et al. (1991). The lactating and pregnant animals were more susceptible to FMD and these results are coincided with the results of Rahman et al. (1989), Sil et al. (1998) and Bachrach (2001).

The clinical signs (high fever, frothy salivation, anorexia etc.) and lesions (sored mouth, sored foot, lameness etc.) observed in this study are in agreement with the study of Kamruddin and Pandit (1988), Blood et al. (1989) and Gangopadhyay et al. (1990).

Sulphonamide or amoxicillin in combination with other drugs were used to treat clinical FMD in this study. These findings are supported by the findings of Rahman et al. (1989), Loeffler and Frosch (1997) and Bachrach (2001). Sulphonamide or amoxicillin was used to prevent secondary bacterial infection. Glycerine or boric acid was applied to produce soothing and coating effects on lesions. They were also used for their antiseptic effects which can reduce excessive salivation.

Table 5: Frequency distribution of drugs used against FMD cases in cattle

Drug prescribed	Doses and duration	Frequency numbers	%	Recovered animal	Recovery %
Sulphonamide and 100% glycerin with 2% boric acid	<ul style="list-style-type: none"> • Sulphonamide-140 mg/kg for 5 days • Glycerin with boric acid amount for 5 days 	3	13.6%	2	66.7%
Amoxicillin and 100% glycerin with 2% boric acid	<ul style="list-style-type: none"> • Amoxicillin-10 mg/kg for 5 days • Glycerin with boric acid for 5 days 	5	22.7%	3	60%
Sulphonamide, Apthocare (Glutamic acid-50mg) and Metamisol (Fevosol)	<ul style="list-style-type: none"> • Sulphonamide-140 mg/kg for 5 days • Apthocare-25 g orally for 5 days • Fevosol-8 ml/100kg for 5 days 	10	45.5%	8	80%
Amoxicillin, FMD Cure (Natrycarbone-40mg) and Metamisol (Fevosol)	<ul style="list-style-type: none"> • Amoxicillin-10 mg/kg for 5 days • FMD Cure for 5 days • Fevosol-8 ml/100kg for 5 days 	4	18.2%	3	75
Total		22	100%	16	72.7%

Glutamic acid or natrycarbhone were also applied to lesions to for their soothing and coating effects and antiseptic action. Metamisol was used to reduce body temperature (Hussain and Sarker, 1978; Sil et al., 1998).

Conclusion

FMD was seen more commonly in younger cattle compared to adult. Female cattle were commonly affected by FMD. Common clinical signs were high fever, salivation, sores tongue, and vesicle formation in the mouth and interdental spaces. The most commonly used drug combination was sulphonamide with apthocare (glutamic acid) and metamisol. The overall recovery rate was satisfactory (72.7%). FMD is curable and preventable disease if we take proper steps in due time.

Acknowledgements

The author would like to acknowledge Prof. Dr. Md. Ahasanul Hoque, Dean, Faculty of Veterinary Medicine, Chittagong Veterinary and Animal Sciences University, for supervising this study; Dr. Bangkim Kumar Halder, Veterinary Surgeon, and Dr. Swapan Kumar Roy, Upazilla Livestock Officer, Upazilla Veterinary Hospital, Batiaghata for their kind cooperation in data collection.

Conflict of Interest

There is no conflict of interest in this study.

Authors' Contribution

Dr. KM Fakhrul Islam conceived the study, collected data and wrote the manuscript, Dr. Shuvo Mazumder and Dr. Md Nurul Quader prepared synopsis, planning and help in writing the manuscript, Dr. Shah Jalal and Dr. Sonnet Podder assist in preparation of interview from for farmers, Dr. Md Sahidur Rahman Formatted the manuscript and arranged references and Dr. Avijit Dutta supervise the work.

References

- Bachrach, H.L. Foot-and-mouth disease. Annual Reviews in Microbiology, 1968; 22(1): 201-244. <https://doi.org/10.1146/annurev.mi.22.100168.001221>
- Blackwell, J.H. Internationalism and survival

- of foot-and-mouth disease virus in cattle and food products. Journal of Dairy Science, 1980; 63(6): 1019-1030. [https://doi.org/10.3168/jds.S0022-0302\(80\)83040-2](https://doi.org/10.3168/jds.S0022-0302(80)83040-2)
- Blood, D.C., Radostits, O.M., Gray, C.C. 1989. Disease caused by virus, Veterinary Medicine, 7th edition, pp. 824-831.
- Chakrabarty, A.K., Dutta, P.K., Boro, B.R., Mahanta, P.N. Seasonal prevalence of foot-and-mouth disease in Assam. Tropical Animal Health and Production, 1979; 11(1): 115-116. <https://doi.org/10.1007/BF02237783>
- Chowdhury, S.M.Z.H., Rahman, M.F., Rahman, M.B., Rahman, M.M. Strains of foot-and-mouth disease virus in different districts of Bangladesh. Asian-Australasian Journal of Animal Sciences, 1996; 9(3): 315-317. <https://doi.org/10.5713/ajas.1996.315>
- Falconer, J. The epizootiology and control of foot-and-mouth disease in Botswana. Veterinary Record, 1972; 91(15): 354-359. <https://doi.org/10.1136/vr.91.15.354>
- Forman, A.J. A study of foot-and-mouth disease virus strains by complement fixation: II. A comparison of tube and microplate tests for the differentiation of strains. Journal of Hygiene, 1974, 72(03): 407-413. <https://doi.org/10.1017/S0022172400023639>
- Fraser, C.M. 1991. The Merck veterinary manual (ed. NJ Rahway), 7th edition, Merck Co., pp. 338-340.
- Gangopadhyay, N.N., Sharma, S.K., Pathak, R.C. Antiviral activity of levamisole and zinc salt on experimental foot-and-mouth disease (FMD) virus infection in baby mice and guinea pigs. Indian Journal of Virology, 1990; 6(1/2): 17-22.
- Hussain, M.D., Sarker, R.I. Performance studies of country ploughs in Bangladesh. Agricultural Mechanisation in Asia, 1978; 1978: 55-60.
- Hyslop, N.S.G. The epizootiology and epidemiology of foot and mouth disease. Advances in Veterinary Science and Comparative Medicine, 1970; 14: 261-307.
- Islam, A., Jalil, M.A., Chowdhury, K.A., Aziz, K.A., Rahman, A. Prevalence of different strains (types) of foot and mouth disease (FMD) virus in Bangladesh. Livestock Adviser, 1985; 10: 54-56.
- Kamaruddin, K.M., Pandit, K.K. Pattern of Foot and mouth disease virus infection in cat-

- tle of Bangladesh. Bangladesh Veterinary Journal, 1988; 5: 54-58.
- Leslie, C., Balows, A., Sussman, M. Microbiology and microbial infections. Systematic Bacteriology, 1998; 2: 829-830.
 - Loeffler, F. and Frosch, P. Antiviral activity of different drugs on experimental Foot and mouth disease virus infection in cattle and buffalo. Zentbl. Bakt. Abt.1, orgi, 1997; 22: 257.
 - Plotnikov, V.T. Occurrence of foot and mouth disease in Uzbekistan during the years 1947-1970. Trudy Uzbekskogo Nauchnoissledovatel, Skogo Veterinarnogo Institut, 1972; 20: 257-262.
 - Radostits, O.M.G., Hinchclif, K.W. 2007. Foot and mouth disease in bovine animal, Veterinary Medicine, 10th edition, Part 1, pp. 1225.
 - Rahman, M.F., Chowdhury, S.M.J.H., Rahman, B.M., Jahan, S., Mian, M.F., Howlader, M.M.R. Prevalence of different types of foot and mouth disease virus in Bangladesh. Bangladesh Veterinary Journal, 1989; 23: 49-53.
 - Sil, B.K., Chowdhury, S., Mian, M., Rahman, F., Yasmin, F., Islam, M.S., Hossain, M.A. Prevalence and economic loss of foot-and-mouth disease in ruminants. Bangladesh Veterinary Journal. 1998.