



Journal of Biological Sciences

ISSN 1727-3048

science
alert

ANSI*net*
an open access publisher
<http://ansinet.com>

Foot and Mouth Disease in Baghabari Milk Shed Area and It's Economic Loss in Bangladesh

¹M.M.R. Howlader, ¹A.T.M. Mahbub-E-Elahi, ²S. Habib, ¹M.J.U. Bhuyian,
¹M.A.B. Siddique, ³M.A. Hai and ⁴M.G. Hossain
¹Sylhet Government Veterinary College, ²Livestock Training Institute, Tilagor, Sylhet
³Veterinary Surgeon, Shahjadpur, Sirajgonj,
⁴Upazilla Livestock Officer, Chowhali, Sirajgonj, Bangladesh

Abstract: The study was carried out during and after an outbreak of foot and mouth disease (FMD) in Baghabari milk shed area, Sirajgonj, Bangladesh for a period of one year. Results showed that the incidence of FMD varied significantly ($p < 0.01$) in different host species with higher incidence in cattle (63.41%) followed by sheep/goats (50.96%) and buffaloes (48.02%). Among cattle, FMD was found to occur significantly ($p < 0.01$) higher in cows (68.01%) than in bulls/bullocks (60.09%) and calves (56.02%). A total of 125 (9.71%) calves died of FMD and the financial loss incurred from this mortality was estimated to be US\$ 6250 (@US\$ 50/calf). The economic losses due to calf mortality, reduced milk yield and draft power would stand at US\$ 163329 for cattle alone. Losses incurred from draft power cattle ranged from 10.5-15.5 kilo-watt hour. The FMD virus types were identified as Asia₁ and O by examining 32 tongue epithelial samples adopting complement fixation test (CFT).

Key words: FMD virus, incidence, milk-shed area, economic loss

INTRODUCTION

Foot and mouth disease (FMD) is an epitheliotropic viral disease affecting the cattle, buffaloes, sheep and goats for several centuries^[1]. The causal agent was one of the first characterized viruses^[2]. It remains one of the most economically important virus diseases of farm animals that causes a substantial reduction in productivity^[3]. It is a highly contagious disease that causes severe economic loss in terms of calf mortality and reduced productivity of the affected animals. The occurrence of the disease in draft cattle during land preparation has been contributing to a lot of sufferings of the farmers that lowers crop production in the locality. The types of FMD virus in Bangladesh were reported as types A, O, C, Asia₁ and sub-type A₂₂^[4-7]. The losses due to FMD of draft cattle in Mymensingh district of Bangladesh were quantified by Rahman *et al.*^[5]. The determination of economic losses that incurred from this disease in milk shed area would help in precise disease control planning by the farmers and government as well. However, no literature was available on financial losses due to FMD in Baghabari milk shed area. This study describes an outbreak of FMD in domestic animals including cattle, buffaloes and sheep/goats and the types and sub-types of virus found during the outbreak and the economic losses due to this malady in Baghabari milk shed area.

MATERIALS AND METHODS

The study was conducted during and after an outbreak of FMD in Baghabari milk shed area from January- December, 1999. The incidence of FMD in cattle, sheep/goats and buffaloes and economic losses incurred from calf mortality, reduced milk yield and draft losses were recorded by interviewing the owners using a questionnaire. All the data were analyzed using SAS (Statistical Analytical System) package at Bangladesh Livestock Research Institute Computer Center^[8] by General Linear Model Procedure. Comparison based on least significant difference at $p = 0.05$ were done between the means of different species and age groups of animals. The infection rate was analyzed using Chi-square ($p < 0.05$). Tongue epithelia from the affected animals were collected and preserved in 50% glycerin phosphate buffer solution and kept in the flasks containing ice which were transported to the Bangladesh Livestock Research Institute laboratory that were preserved at -20°C until they were analyzed. The collected tongue epithelia were ground using pestle and mortar in phosphate buffer saline (PBS) and used as test antigen after being centrifuged at 3000 rpm for 10 min. Pooled sera collected from a number of male guinea pigs were used as complement. Specific antisera against types A, O, C, Asia₁, A₂₂ and A₅ that obtained from the World Reference Laboratory, Pirbright,

United Kingdom were used as test antibody. Micro-complement fixation test (CFT) was done for typing and sub-typing of the viruses, respectively, following the procedure of Forman^[9] and Pereira^[10].

RESULTS AND DISCUSSION

Incidence of FMD in different species of hosts and various age groups of cattle in an outbreak in Baghabari milk shed area was shown in Table 1. Of the total 6147 animals observed in the milk-shed area, 4845 were cattle, 938 sheep/goats and 329 buffaloes. Incidence of FMD varied significantly ($p < 0.01$) in different host species with higher incidence in cattle (63.41%) followed by sheep/goats (50.96%) and buffaloes (48.02%) which were in agreement with the findings of Rahman *et al.*^[7]. Nevertheless, the incidence in a specific animal species was higher than the findings of Rahman *et al.*^[7]. Among cattle, FMD was found significantly ($p < 0.01$) higher in cows (68.01%) than in bull/bullocks (60.09%) and calves (56.02%) (Table 1). The rate of infection among different groups of cattle confirmed the findings of Plotnikov^[11] and Rahman *et al.*^[7]. The indiscriminate movement of the animals from place to place for generating draft power could be attributed to the main reason of quick spread of the disease in the area.

Out of 1287 FMD affected calves, 125 (9.71%) died and the economic loss incurred from the calf mortality alone was estimated to be US\$ 6250 (@ US \$ 50/calf) (Table 2). Rahman *et al.*^[7] found 49.5% calf mortality

due to FMD which was higher than the present findings. Lower calf mortality that was observed in the present study might be due to the treatment that was provided to the FMD affected calves with antibiotics and or sulphanilamides in order to prevent the secondary bacterial infections, as the farmers of Baghabari milk shed area have been experiencing the trends of calf mortality from FMD in recent years^[6,7]. Cattle were found to be suffered from FMD for a period of 15-20 days with an average of 18.8 days. While the working cattle kept abstained from work for a period of 14-28 days with an average of 20.5 days. The loss of draft power ranged from 10.5-15.5 kilo-watt hour which were calculated using a 4 h working period per day for each cattle and 0.2-0.3 horse power working energy per cattle^[12]. The diseased period, losses during working days and losses from draft power for each FMD affected cattle were found to be inconsistent with the findings of Rahman *et al.*^[7]. A total of 32718 ploughs were found to be lost during 20.5 days working period and 3210 ploughs were found to be hired to plough the land that was required to cultivate and prepare by using the draft animals, while they were not affected by FMD. The value of the ploughs was estimated to be US\$ 89820 based on US\$ 2.5 for each plough. The losses incurred from 134518 L of reduced milk yield during and after infection period and mortality of 125 calves were estimated to be US\$ 67259 (@ US\$ 0.5/L) and US\$ 6250.0 (@ US\$ 50/calf), respectively. Thus, the total loss on account of calf mortality, reduced milk yield and draft power in Baghabari milk shed area would stand at US\$ 163329. The farmers in Baghabari milk shed area would profit much if they could readily know the types and strains of the FMD viruses that affect their livestock.

In the present study, a total of 32 field virus samples were tested by complement fixation test (CFT) of which 12 were found positive with Asia₁ and 15 with type O and the rest 5 were either negative or anticomplementary. Previous typings have shown that Baghabari milk shed area has virus type O^[6,7]. The emergence of new types in this area could be attributed to mutagenic change of the virus and to extensive movement of animals for different purposes. The typing and sub-typing of this FMD virus in the field would help the vaccine production laboratory in Bangladesh as a guide line for the production of effective and low cost vaccines against the specific type and sub-type of virus that would substantially reduce the economic loss from FMD.

ACKNOWLEDGMENTS

We thank the Director General of Bangladesh Livestock Research Institute, Savar, Dhaka, Bangladesh for his advice and cooperation during the conduct of the

Table 1: Incidence of foot and mouth disease in different host species at Baghabari milk shed area

Observed host	Observed animals	Affected animals	Morbidity%
Cattle	4845	3072	63.41 ^{ab}
Cow	2585	1758	68.01 ^a
Bulls/Bullocks	973	593	60.09 ^b
Calves	1287	721	56.02 ^{bc}
Sheep/Goats	938	478	50.96 ^{cd}
Buffaloes	329	158	48.02 ^d
Total	6147	3708	60.32

Figures in a column followed by different superscripts differed significantly ($p < 0.01$) in various host species and groups of cattle

Table 2: Economic losses incurred due to outbreak of foot and mouth disease in cattle in Baghabari milk shed area

Parameter of losses	Kinds of loss	Unit loss (US\$)	Total loss (US\$)
Draft power ^a	35928 ploughs	2.5	89820
Calf mortality	125 calves	50.0	6250
Reduced milk yield ^b	134518 liters	0.5	67259
Total loss			163329

^aLoss of draft power included loss of 1596 ploughs per day for 20.5 days on average and 3210 ploughs hired for draft purpose, but draft power loss 10.5-15.5 kilo-watt hour not included.

^bLoss of milk production included reduced milk yield during and after infection and losses from milk yield due to calf mortality. The conversion rate of Taka 50= US\$ 1 was used during economic analysis.

research. We also acknowledge the help of Dr. Bijon Kumar Sil, Principal Scientific Officer of Bangladesh Livestock Research Institute, Savar, Dhaka, Bangladesh for his cordial support during the laboratory analysis of FMD samples.

REFERENCES

1. Cottral, G.E., M.S. Shahan and H.R. Seibold, 1970. In: *Bovine Medicine and Surgery*. (Gibbons, W.J., E.J. Catcott and J.F. Sithcors, Eds.), Am. Vet. Pub., Wheaton, Illinois, pp: 56-72.
2. Loeffler, F. and P. Frosch, 1897. *Zentbl. Bakt. Abt. 1 orgi.*, 22: 257.
3. Brown, F., A.R. Carroll, B.E. Clarke, E.J. Ouldridge and D.J. Rowlands, 1985. In: *Veterinary Viral Diseases*. (Della-Porta, A.J. Ed.), Academic Press, Orlando, Florida, pp: 265-272.
4. Islam, A., M.A. Jalil, K.A. Chowdhury, K.A. Aziz and A. Rahman, 1985. Prevalence of different strains (types) of foot and mouth disease (FMD) virus in Bangladesh. *Livestock Adviser*, 10: 54-56.
5. Rahman, A., J.U. Ahmed and A. Islam, 1985. Quantification of losses among draught cattle due to foot and mouth disease: A case study in Mymensingh district, Bangladesh. *Indian J. Ani. Sci.*, 55: 25-26.
6. Rahman, M.F., S.M.Z.H. Chowdhury, M.B. Rahman, S. Jahan, M.F. Mian and M.M.R. Howlader, 1989. Prevalence of different types of foot and mouth disease virus in Bangladesh. *Bangladesh Vet. J.*, 23: 49-53.
7. Rahman, M.F., S.M.Z.H. Chowdhury, M.F. Mian and B.K. Sil, 1991. Coordinated research programme on foot and mouth disease in Bangladesh. (January 1988-June 1991), Published by Animal Health Research Division, Bangladesh Livestock Research Institute, Savar, Dhaka, presented in the workshop held at Bangladesh Agricultural Research Council (BARC), October 1991.
8. *SAS/Statistics for Personal Computers Guide*, 1988. SAS Institute, Cary, NC, pp: 549.
9. Forman, A.J., 1974. A study of foot and mouth disease virus strains by complement fixation. A comparison of tube and microplate test for differentiation of strains. *J. Hyg. Cambridge*, 72: 407-413.
10. Pereira, H.G., 1977. Subtyping of foot and mouth disease virus. *Dev. Biol. Standard.*, 35: 167-174.
11. Plotnikov, V.T., 1972. Occurrence of foot and mouth disease in Uzbekistan during the years 1947-1970. *Trudy Uzbekskogo Nauchnoissledovatel, Skogo Veterinarnogo Institut*, 20: 257-262.
12. Hussain, M.D. and R.I. Sarker., 1978. Performance studies of country ploughs used in Bangladesh. *AMA. Japan*, 9: 55-60.