

**A REPORT ON
FOOT AND MOUTH DISEASE COMPARING ITS
MEDICINAL TREATMENT WITH SERUM THERAPY
AT RANGUNIA IN CHATTOGRAM, BANGLADESH**



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Session: 2015-2016

A clinical report submitted in partial satisfaction of the requirements for
the degree of *Doctor of Veterinary Medicine*

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Chattogram Veterinary and Animal Sciences University

Khulshi, Chattogram-4225, Bangladesh

November, 2021

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INDEX

Chapter	Contents	Page No.
	List of Tables	IV
	List of Figures	V
	List of Abbreviations	V
	ABSTRACT	VI
CHAPTER I	INTRODUCTION	01-03
CHAPTER II	MATERIALS AND METHODS	04-07
	2.1 Study Period	
	2.2 Study Area	
	2.3 Data Collection	
	2.4 Data Analysis	
CHAPTER III	RESULTS	08-16
CHAPTER IV	DISCUSSION	17-18
CHAPTER V	LIMITATIONS	19
CHAPTER VI	CONCLUSION	20
	REFERENCES	21-23
	ACKNOWLEDGEMENT	24
	APPENDIX	25
	BIOGRAPHY	26

List of Tables

Table No.	Contents	Page No.
Table 3.1	Distribution of FMD cases at Upazilla Veterinary Hospital, Rangunia, Chattogram according to demographic factors	08
Table 3.2	Distribution of FMD cases at Upazilla Veterinary Hospital, Rangunia, Chattogram according to physiological factors	09
Table 3.3	Distribution of FMD cases at Upazilla Veterinary Hospital, Rangunia, Chattogram according to managerial factors	10
Table 3.3	Distribution of FMD cases at Upazilla Veterinary Hospital, Rangunia, Chattogram according to variation of months	11
Table 3.4	Frequency of clinical signs of FMD cases in animals registered at Upazilla Veterinary Hospital, Rangunia, Chattogram (N=145)	12
Table 3.5	Frequency distribution of duration of illness of FMD cases in animals	14
Table 3.6	Frequency of given treatment and side effects	14
Table 3.7	Frequency distribution of drugs prescribed in FMD cases	15
Table 3.8	Comparison between Medicinal treatment and serum therapy in FMD cases	16

List of Figures

Figure No	Contents	Page No
Fig 2.1	Geographical location of study area	04
Fig 2.2	Restraining of gayal for blood collection	06
Fig 2.3	Blood collection	06
Fig 2.4	Centrifugation of collected blood	06
Fig 2.5	Collection of serum	06
Fig 2.6	Injection of serum in FMD infected animals	06
Fig 3.1	Frothy salivation	13
Fig 3.2	Sore tongue	13
Fig 3.3	Sore mouth	13
Fig 3.4	Sore foot	13
Fig 3.5	Dead calf	13

List of Abbreviations

Abbreviation	Elaboration
BBS	Bangladesh Bureau of Statistics
BCS	Body Condition Score
bw	body weight
DLS	Department of Livestock Service
FMD	Foot and Mouth Disease
LRI	Livestock Research Institute
mg/kg	milligram per kilogram
N	Number
SAT	South Asian Territory
USA	United States of America
UVH	Upazilla Veterinary Hospital

ABSTRACT

There are so many viral diseases that causes economic loss in livestock production. Among them, Foot and mouth disease (FMD) is considered to be the most economically devastating disease which affects cattle, buffalo, sheep, goat and wild animals of several countries. It is a severe, highly contagious viral disease that results in significant economic loss regarding reduced productivity of the affected animals as well as mortality specifically among young animals. Both retrospective and prospective clinical cases of FMD were included in the present study at Rangunia in Chattogram from 1st February to 31st April in 2021. During this three-month study period, a total of 145 FMD infected animals (Cattle and Gayal) were registered at the Upazilla Veterinary Hospital (UVH) where two treatment protocols were practiced including treatment with medicine and serum therapy with a view to comparing the efficacy the given treatment against FMD cases. Among the infected animals, 38.6% was cattle and 61.4% was Gayal. Almost 66.2% affected animals were crossbreds. The occurrence of FMD was higher in January (68.3%) than February (26.2%) and March (10%). Almost 43.4% female animals (Cattle & Gayal) were affected by FMD. The lactating animals and pregnant animals were more commonly affected (81.8% and 63.6%, respectively). Common clinical signs of FMD were high fever (100%), sore foot (72.7%) and sore mouth (63.6%). About 11.7% affected animals were treated with serum and 88.3% were treated with medicine. Serum was obtained from two FMD recovered Gayal. Medicines usually used were mainly antibiotic, antiviral drug, anti-inflammatory drug and antiseptics. The recovery rate was 2% higher in serum therapy and required less time than those animals treated with medicine.

Keywords: FMD, Clinical sign, Treatment, Serum Therapy, Medicine, Recovery rate

CHAPTER I

INTRODUCTION

Bangladesh is an agro-economy based country. About 70% people of this country are directly or indirectly interconnected with agriculture and livestock production (BBS, 2019-2020). The contribution of livestock to country's GDP is about 1.44% (DLS, 2020-2021). Cattle and Gayal are considered to be two economically important genetic resources. Population of cattle was reported 243.91 lac (DLS, 2019-2020). Gayal is an endangered species in Bangladesh. Its population is less than 1000. (DLS, 2019-2020) But due to viral diseases affecting these two economically important resources, farmers are losing interest in livestock farming.

Some viral diseases that cause economic losses in livestock sector are Foot and Mouth disease (FMD), Black Quarter (BQ), Hemorrhagic Septicemia (HS) and Anthrax etc. Among these viral diseases, Foot and Mouth Disease creates a serious effect in livestock production in Bangladesh (Chowdhury *et al.*, 1994; Loeffler and Frosch, 1997).

FMD is a highly contagious viral disease caused by Aphthovirus belonging to the family Picornaviridae. It is also known as aphthous fever which is one of the most important economic and transboundary infectious viral diseases, responsible for global losses of livestock production and trade. Outbreaks of FMD in an organized farm are usually associated with entry of new animals from outside. The incubation period varies between 24 hours and 10 days or even longer. This disease is mainly characterized by high fever (104-106⁰ F), epithelial erosion in tongue and inner mouth that leads to excessive drooling salivation and foot lesion causing lameness. Cloven footed animals such as cattle, buffalo, gayal, sheep, goat etc. are commonly affected (Blood *et al.*, 1989).

There are seven immunologically distinct serotypes: O, A, C, SAT-1, SAT-2, SAT-3 and Asia-1 and over 60 strains within these serotypes. In Bangladesh, serotypes O, A, C and Asia-1 have been circulating which are considered as endemic in cattle (Islam *et al.*, 1985). All the serotypes possess different antigenicity. Hence, immunity to one serotype cannot provide any cross protection to other serotypes. (Chowdhury *et al.*, 1994). Foot and Mouth disease virus is most stable between

pH 7.4 and 7.6 and it is rapidly destroyed by acid and alkali (Fraser *et al.*, 1991). It survives well below 4⁰C and may be stored under freezing temperature for many years. The most FMD field strains are inactivated at 56⁰C temperature for 30 minutes (Loeffer and Frosch, 1997).

Foot and Mouth Disease virus enters into the body through inhalation or ingestion and then replicates in different tissues. After replication, primary vesicle formed by the virus appears within 1 to 4 days and viremia with fever is observed 2 days later. Formation of secondary vesicle occurs on stratified squamous epithelium like lip gum, dental pad, interdigital cleft (Fraser *et al.*, 1991). Virus reaches to the predilection sites through bloodstream and multiplies. Then it sheds out from the respiratory tract and feces, urine, semen, saliva and milk (Forman, 1974).

Though there is no specific treatment available for FMD affected animals, nursing and supportive antimicrobial therapy, applying antiseptics on the affected areas may improve healing of the lesions (Hussain and Sarker, 1978).

Foot and Mouth Disease can be controlled by following vaccination schedule. Commonly used local vaccines against FMD produced by Livestock Research Institute (LRI), Mohakhali, Dhaka, Bangladesh are monovalent (strain A), bivalent (strain A and O) and trivalent (strain A, O and Asia-1) which are injected at 3 ml, 6ml and 9ml intramuscularly in four-month-old animal respectively (LRI, 2018). Boostering should be maintained at 4-6 months interval afterwards (Fraser *et al.*, 1990). This disease can be prevented and controlled by strong biosecurity measures like preventing entry of foreign materials, isolation of infected animals, quarantine of newly introduced animals and using foot bath at the entry of farm or shed. (Chowdhury *et al.*, 1993). Proper management systems like washing the manger, gutter, common alley, feeding materials, litter management etc. will also prevent the occurrence of FMD (Radostits *et al.*, 2007).

FMD in cattle and gayal results in great economic losses. As there is no specific drug for viral diseases, serum prepared from the specific disease affected animal can be used in treating others affecting from the same viral disease. Application of serum therapy against viral diseases gives well recovery of animals (Georgina *et al.*, 2017).

But there's no such report was found in Bangladesh regarding FMD in gayal and treating FMD cases with serum.

Therefore, the present study was conducted at Upazilla Veterinary Hospital (UVH), Rangunia, Chattogram, Bangladesh with a view to investigating occurrence of FMD and comparing the efficacy of serum therapy with the usual treatment protocol of FMD with medicine.

With this end in view, the objectives of the present study are following:

1. To know the distribution of FMD according to different factors (Demographic, management, physiological) at Upazilla Veterinary Hospital, Rangunia, Chattogram.
2. To investigate clinical signs and duration of illness of FMD infected animals.
3. To describe treatment protocol used in FMD cases.
4. To compare efficacy between serum therapy and medicinal treatment against FMD.

CHAPTER II

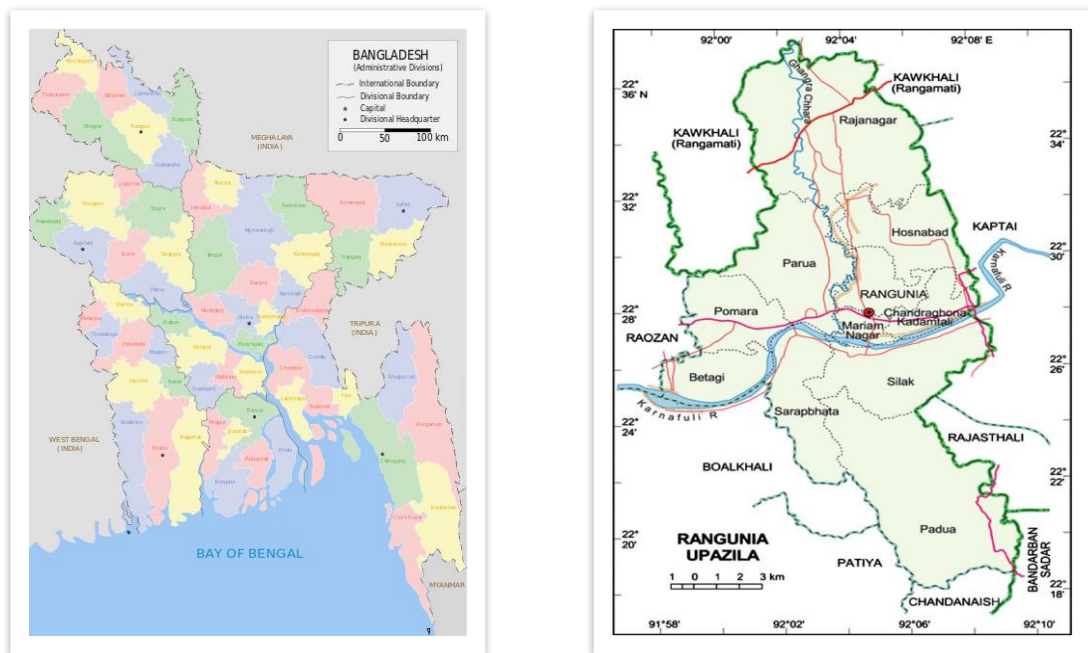
MATERIALS AND METHODS

2.1 Study period:

The case study on Foot and Mouth Disease was conducted at Rangunia Upazilla, Chattogram during the three-month internship period (1st February, 2021 – 31st April, 2021).

2.2 Study area:

The study was performed at Upazilla Livestock Office, Rangunia in Chattogram district, Bangladesh. It has 46,176 households and a total area of 347.72 km². It is surrounded by Chandanaish Upazilla on the south; Patiya Upazilla, Boalkhali Upazilla, Raozan Upazilla & Kawkhali Upazilla of Rangamati district on the west; Kawkhali Upazilla of Rangamati district on the north and Kaptai Upazilla & Rajasthali Upazilla of Rangamati district and Bandarban Sadar Upazilla on the east.



(a)

(b)

Fig 2.1 Geographical location of data collection site. (a) Map of Bangladesh, (b) Map of Rangunia Upazilla.

2.3 Data collection:

Cases of FMD were diagnosed according to recorded clinical signs and clinical history. Data related to animal demography (age, sex and breed), physiological status (body condition score, lactation status, pregnancy status, parity), management factors (housing, feeding, deworming, vaccination), monthly variation, duration of illness, along with clinical signs and treatment were recorded in the questionnaire through close physical inspection and interviewing farmers and also from the hospital register. Body condition score was assessed by examining the rib, hind quarter, fore quarter, pin bone, thigh muscle and hip joint as per published description (Sil *et al.*, 1995). Animals less than 1 year were considered as younger and those more than 1 year were considered as adult as per definition in a study (Radostits *et al.*, 2007).

2.4 Treatment Protocol:

Two ways of treatment protocol were taken: 1. Medicine, 2. Serum therapy.

1. Medicine: A group of animals were treated with medicine. Medicines usually used in FMD cases were combination of Streptomycin and Penicillin, Penicillin as antibiotic; Acyclovir as antiviral drug; Flunixin Meglumine, Tolfenamic acid as Anti-inflammatory drug; FMD Cure Vet (Natricarbon -40mg), Necromid (herbal), Protex G spray (herbal), Turmeric powder as topical supplement.
2. Serum Therapy: Serum therapy was performed in a group of animals of a farm located in Rangunia Upazilla. 1200 ml of blood was collected from 2 FMD cured gayals which had recovered from FMD 5 days ago and were healthy and free from other diseases. The gayal was restrained by handler tying rope on its throat (Fig. 2.2) and provided with salts for licking so that it remained calm and quiet during collection of blood. We collected blood from both jugular vein and cephalic vein (Fig. 2.3). Collected blood was then poured into collection tube. Centrifugation was done at 2000 rpm for 15 minutes to separate serum from whole blood (Fig. 2.4). Next the serum was taken in the syringe and ready for applying in those affected animals. Serum was given at a dose of 5ml and 2ml for the adults and the calves respectively (Fig. 2.6).



Fig. 2.2 Restraining of gayal for blood collection



Fig. 2.3 Blood collection



Fig.2.4 Centrifugation of collected blood



Fig.2.5 Collection of serum



Fig. 2.6 Injection of serum in FMD infected animals

Efficacy of serum therapy against FMD was then compared with usual medicinal treatment.

2.5 Data Analysis: The obtained data were stored in Microsoft Excel-2007 for analysis. Descriptive analysis was performed. Results were expressed as frequency and percentage against each category of variables.

CHAPTER III

RESULTS

3.1 Occurrence of Foot and Mouth Disease in cattle according to different factors

A number of 145 animals including cattle (56) and gayal (89) were diagnosed affected by Foot and Mouth Disease virus. Adults were more commonly affected than younger. 66.2% affected animals were crossbreds. Almost 56.6% FMD cases were male animal. (Table 3.1)

Table 3.1 Distribution of FMD cases at Upazilla Veterinary Hospital, Rangunia, Chattogram according to demographic factors

Factors	Categories	Frequency numbers	Percentage (%)
Species	Cattle	56	38.6%
	Gayal	89	61.4%
Breed	Local	47	32.4%
	Crossbred	96	66.2%
	Brahman	2	1.4%
Age (Year)	< 0.5	11	7.6%
	0.5-1	12	8.3%
	1-2	17	11.7%
	2-4	105	72.4%
Sex	Male	82	56.6%
	Female	63	43.4%

Animals with body condition score (4) had higher FMD cases. Pregnant animals were frequently affected by FMD as compared to non-pregnant animals (35 versus 28 cases). Lactating animal had more cases than non-lactating animals (34 versus 29 cases). Animals with parity 1 had higher FMD cases than those with parity 2 (19 versus 15). (Table 3.2)

Table 3.2 Distribution of FMD cases at Upazilla Veterinary Hospital, Rangunia, Chattogram according to physiological factors

Factors	Categories	Frequency numbers	Percentage (%)
BCS	2	3	2.1%
	3	32	22.1%
	4	64	44.1%
	5	46	31.7%
Pregnancy status	Yes	35	55.6%
	No	28	44.4%
Lactation status	Yes	34	54%
	No	29	46%
Parity	1	19	30.2%
	2	15	23.8%

About 98.6% FMD cases were found in semi-intensive rearing system. About 94.8% affected animal was reared on concrete floor and 2.8% animals on straw as litter. 94.5% were fed roughage and concentrate. Almost 80.7% animals were dewormed. Non-vaccinated animals had higher cases than vaccinated animals. (Table 3.3)

Table 3.3 Distribution of FMD cases at Upazilla Veterinary Hospital, Rangunia, Chattogram according to managerial factors

Factors	Categories	Frequency numbers	Percentage (%)
Rearing system	Intensive	2	1.4%
	Semi-intensive	143	98.6%
Floor type	Bricks	5	3.4%
	Concrete	137	94.5%
	Soil	3	2.1%
Litter type	Straw	4	2.8%
	No litter	141	97.2%
Feeding	Roughage, Concentrate	137	94.5%
	Concentrate	3	2.1%
	Roughage, Concentrate, Milk	5	3.4%
Deworming	Yes	117	80.7%
	No	28	19.3%
Vaccination	Yes	54	37.2%
	No	91	62.8%

3.2 Temporal distribution of Foot and Mouth Disease

About 68.3% FMD cases were recorded in January, 26.2% in February and 10% in March. (Table 3.4)

Table 3.4 Distribution of Foot and Mouth Disease cases at Rangunia Upazilla Veterinary Hospital, Chattogram according to variation of months

Month	Total no. of cases	Percentage (%)
January	62	68.3%
February	77	26.2%
March	8	10%
Total	145	100%

3.3 Description of clinical signs along with duration of illness of Foot and Mouth Disease cases in animal

Almost 68.3% animals had high fever (104-106⁰F). Other common clinical signs and lesions were encountered in FMD cases including frothy salivation (23.4%), sore foot (18%), sore tongue (13.1%). About 3.4% animals were died during the study which were calves of gayal (Table 3.5; Fig 3.1, Fig 3.2, Fig 3.3, Fig 3.4, Fig 3.5).

Duration of illness encountered in FMD cases were 1 week (7% cases), 2 weeks (87% cases), 3 weeks (4% cases), 4 week (1.4% cases), 5 weeks (0.7% cases). (Table 3.6)

Table 3.5 Frequency of clinical signs of FMD cases in cattle registered at Upazilla Veterinary Hospital, Rangunia, Chattogram (N=145)

Clinical signs	Frequency numbers	Percentage (%)
Fever (104-106 ⁰ F)	99	68.3%
Frothy salivation	34	23.4%
Sore foot	26	18%
Sore tongue	19	13.1%
Dead	5	3.4%



Fig. 3.1 Frothy salivation



Fig. 3.2 Sore tongue

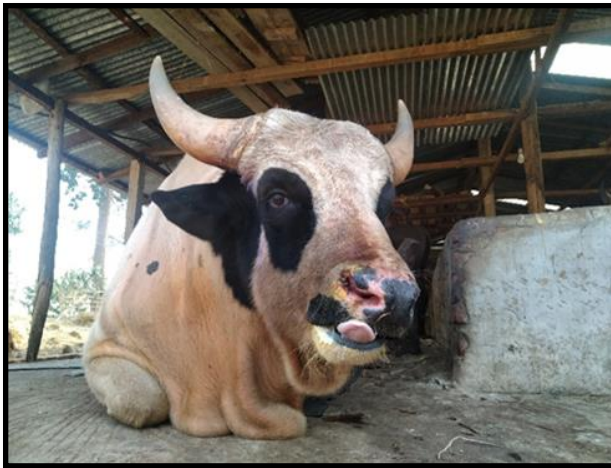


Fig. 3.3 Sore Mouth

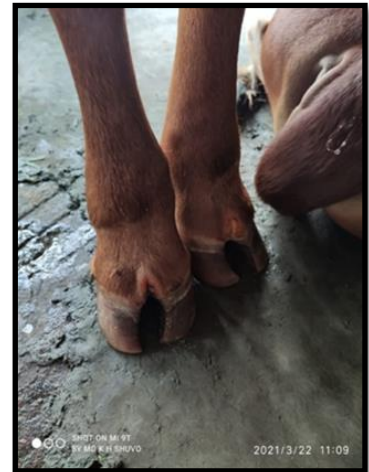


Fig. 3.4 Sore foot



Fig. 3.5 Dead calf

Table 3.6 Frequency distribution of duration of illness of FMD cases in animals

Duration of illness (Week)	Frequency numbers	Percentage (%)
1	10	7%
2	126	87%
3	6	4%
4	2	1.4%
5	1	0.7%

2.4 Description of treatment given against clinical Foot and Mouth Disease cases in cattle and gayal

About 88.3% FMD cases were treated with serum therapy and 11.7% cases were treated with medicine. No side effects were observed after serum therapy. About 10% cases treated with medicine were recorded anorexia and 17.6% cases with decreased milk production. (Table 3.7)

Table 3.7 Frequency of treatment given and side effects

Treatment	Frequency	Percentage (%)	Side effect			
			Anorexia	Percentage (%)	Decreased milk production	Percentage (%)
Medicine	17	11.7%	10	58.8	3	17.6%
Serum therapy	128	88.3%	-	-	-	-

Different drug combinations were prescribed for the treatment of FMD cases. Almost 64.7% cases were provided Penicillin as antibiotic. Combination of Streptomycin and Penicillin was used in 23.5% cases. Acyclovir was used in 100% cases. Flunixin Meglumine was used in 70.6% cases. Along with these, FMD Cure Vet (17.6%), Necromid (17.6%), Protex G spray (41.2%), Turmeric (11.8%) were also prescribed as supportive treatment. (Table 3.8)

Table 3.8 Frequency distribution of drugs prescribed in FMD

Drug prescribed	Doses and course	Frequency	Percentage (%)
Streptomycin + Penicillin	10mg/kg bw daily for 7 days	4	23.5%
Penicillin	10mg/kg bw daily for 7 days	11	64.7%
Acyclovir	400mg/animal daily for 7 days	17	100%
Flunixin Meglumine	10mg/kg bw daily for 3 days	12	70.6%
Tolfenamic acid	1mg/kg bw for 3 days	4	23.5%
FMD Cure Vet (Natricarbone-40 mg)	2-3 times daily until recovery	3	17.6%
Necromid (Herbal)	2 times daily until recovery	3	17.6%
Protex G spray (Herbal)	2-3 times daily until recovery	7	41.2%
Turmeric	2-3 times daily until recovery	2	11.8%

About 96.1% cases were recovered from serum therapy within 5 to 10 days of treatment. 94.1 % was recovered from medicine where 94% was recovered within 20 to 30 days and 4% within 30 to 40 days. (Table 3.9)

Table 3.9 Comparison between medicinal treatment and serum therapy in FMD

Treatment	Total recovered	Recovery %	Time required to cure					
			5-10 days	%	20-30 days	%	30-40 days	%
Medicine (17)	16	94.1%	-	-	15	94%	1	6%
Serum therapy (128)	123	96.1%	123	100%	-	-	-	-

CHAPTER IV

DISCUSSION

The present study at Upazilla Veterinary Hospital, Rangunia, Chattogram was conducted to know the distribution of FMD according to different factors (Demographic, management, physiological), to investigate clinical signs and duration of illness along with its treatment and to compare the efficacy between medicine and serum therapy.

Since gayal and cattle are both cloven-footed animals, both are susceptible to FMD (Rout *et al.*, 2012). This study found that occurrence of FMD was higher in gayal than cattle. It was due to the presence of higher number of gayals in the study than cattle.

In the present study, adult animals were more commonly affected than younger. Almost 56.6% FMD cases were male animal. Cross-bred animals were more frequently affected than indigenous breed. Similar observations were reported in previous studies (Falconer, 1972; Chowdhury *et al.*, 1994).

From the study, animals having poor body condition score had more FMD cases which is supported by a previous study (Fraser *et al.*, 1991).

The lactating and pregnant animals were more susceptible to FMD and these results are coincided with the results of previous studies (Rahman and Chowdhury, 1989; Sil *et al.*, 1995 and Bachrach, 2001).

In this study, about 98.6% FMD cases were found in semi-intensive rearing system. About 94.8% affected animal was reared on concrete floor and 2.8% animals on straw as litter. Almost 80.7% animals were dewormed. Non-vaccinated animals had higher cases than vaccinated animals. These findings are well acceded by a previous study (Blackwell, 1980).

In this study, the occurrence of FMD was higher in January than any other month which is similar to the previous studies (Plotkinov, 1972; Chakrabarty *et al.*, 1979). They found 26% FMD in summer (April-June), 43% in rainy (July-September), 52% in winter (October-January) and 47% in autumn (February-March) seasons (Chowdhury *et al.*, 1994).

In the present study, the observed clinical signs and lesions were high fever, frothy salivation, sore mouth, sore foot, lameness etc. which are strongly agreed with previous studies (Kamruddin and Pandit, 1988; Blood *et al.*, 1989 and Gangopadhyay *et al.*, 1990).

This study found that 3.4 % animals were died due to FMD which were calves. No adult animals were died during the study. That means FMD is fatal for young animals which is strongly supported by previous study (Abubakar *et al.*, 2013).

In the study, antibiotic, anti-inflammatory drug and antiseptics were found effective in treating FMD. This finding is also supported by previous study (Islam *et al.*, 2016).

In the present study, animals treated with serum therapy showed higher recovery within short period of time than animals treated with usual medicine. Moreover, no side effects were recorded from the animals treated with serum therapy. About 10% cases treated with medicine were recorded anorexia and 17.6% cases with decreased milk production which is supported by previous study (Hussain and Sarker, 1978; Kamruddin and Pandit, 1988).

LIMITATIONS

The number of clinical FMD cases in this study was limited. Inclusion of retrospective FMD cases was also a limitation because information of retrospective cases may not be as accurate as fresh cases. The diagnosis of FMD was only based on clinical signs. The period of the study was short to follow up the cases. Moreover, due to pandemic of the CoViD19 outbreak, data collection was not possible directly at the ending of the study.

CONCLUSION

The present study revealed that potential risk factors associated with Foot and Mouth Disease in different livestock species were breed, age, sex, season, farm management and environmental factors. Clinical signs of FMD were recorded high fever, salivation, sore tongue, sore mouth and sore foot. Besides, treating FMD with serum obtained from FMD recovered animal gave higher recovery rate and required less time than treating with usual medicines like antibiotic, anti-inflammatory drugs and antiseptics. It may be concluded from this study that serum therapy can be used successfully to treat the FMD infected animal. Last but not least, hygienic and good management practice can improve the recovery rate.

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ACKNOWLEDGEMENT

The author wishes to acknowledge the immeasurable grace and profound kindness of Almighty “GOD” the supreme authority and supreme ruler of universe, who empowers the author to complete the work successfully.

The author feels proud in expressing her deep sense of great gratitude and indebtedness to respected teacher and tutor **DR. Towhida Kamal**, Assistant Professor, Department of Pathology and Parasitology, Faculty of Veterinary Medicine, Chattogram Veterinary and Animal Sciences University for his trustworthy and scholastic supervision.

The author would like to express my deep sense of gratitude and thanks to **Professor Dr. Md Alamgir Hossain**, Dean, Faculty of Veterinary Medicine, CVASU.

The author expresses her sincere gratitude and thanks to Professor **Dr. A. K. M. Saifuddin**, Director of External Affairs, and for his supervision and kind co-operation during the period of internship.

The author gratefully admits the help of **DR Harun Ar Rashid**, Veterinary Surgeon and **Md. Mustafa Kamal**, Upazilla Livestock Officer, Upazilla Veterinary Hospital, Rangunia; Chattogram for their cordial supervision, scholastic guidance and valuable suggestion during the entire period of the study.

Thanks to the owner of the farm and other helping hands who helped in collecting data for this study.

Last but not least, the author profoundly grateful to her family members for their endless sympathies, kind co-operation, sacrifices and prayers.



Author

November, 2021

APPENDIX

Questionnaire

Case No:	Date:	Phone No:
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A. General information:

1. Owner's name:
2. Address:
Village: Upazilla: Zilla:
3. Species: Cattle/Sheep/Goat/Gayal
4. Breed:
5. Herd Size:

B. Case Information:

6. Sex: M/F
7. BCS: 1/2/3/4/5
8. Age:
9. Weight: kg
10. Pregnancy status: Yes/No
11. Parity: 1st / 2nd / 3rd / 4th / 5th / >6th
12. Lactation Status: Lactating / Non-lactating

C. Housing & Feeding:

13. Type: Intensive / Semi-intensive / Extensive
14. Floor type: Bricks / Concrete / Soil / Wood bed
15. Litter type: No / Rubber bag / Jute bag / Straw / Others
16. Feed: Concentrate / Roughage / Both

D. Health Status:

17. Deworming: Yes / No
18. Vaccination (FMD): Yes / No
19. Clinical signs:
Temp: Subnormal / Normal / Increased
Salivation: Present / Absent
Sore mouth: Present / Absent
Sore foot : Present / Absent
20. Duration of illness: 1 / 2 / 3 / 4 / 5 weeks

E. Treatment: Medicine/ Serum therapy

21. Medicines used:
22. Effectivity of medicine: Effective / not effective
23. Effectivity of serum therapy: Effective / not effective
24. Recovery: 5-10 days / 20-30 days/ 30-40 days / not recovered

BIOGRAPHY



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This is Labonya Barua, daughter of Mr. Nir Kamal Barua and Mrs. Ruma Barua. She passed Secondary School Certificate (SSC) examination obtaining GPA 5.00 from Rotary Betagi Union High School, Chattogram in 2013 and Higher Secondary Certificate (HSC) examination obtaining GPA 5.00 from Chattogram Engineering University School and College, Chattogram in 2015. Then she enrolled for the degree 'Doctor of Veterinary Medicine (DVM)' in Chattogram Veterinary and Animal Sciences University (CVASU), Bangladesh. At present, she is dealing as an undergraduate intern veterinarian. She has a high interest in medical research and public health. As a veterinarian, the author wishes to develop her career in the field as a Veterinary Surgeon. Above all, as a human being, she wants to serve the nation through her knowledge, creativity and profession.