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***The author***

***March, 2014***

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**Incidence,Clinical Observations and Management of FMD and its Complications in Cattle at Harirampur Upazilla Manikgonj District.**

**ABSTRACT** A study was carried out on Foot and Mouth Disease at Harirampur Upazilla in Manikgonj district. Both prospective and respective data were collected during my placement schedule e. g. on 5 May,2013 to 28 February,2014. Total 1950 animals were observed in my Upazilla, among four unions e. g. Chala, Boira, Gala and Sutaluri. The incidence of FMD varied significantly in different unions with higher incidence at Chala (94.44%) in June month and lower incidence at Gala (28.17%) in January month and higher percentage of incidence at Boira union(27%) and lower percentage of incidence at Gala union(22%) as well as highest incidence(72.48%) in June month and lowest incidence(37.52%) in February month was found during the period of ten month (5 May, 2013 to 28 February, 2014). The observed main clinical signs were high temperature, profuse salivation, vesicles found in the mouth, tongue, muzzle, dental pad, coronary bend and interdigital space. The observed pathological lesions were vesicular lesions on the mouth especially in the tongue, lips, gum, dental pad, coronary bend and interdigital space. Rupture of vesicles & secondary bacterial infections may occur other serious complications. The economic loss due to consequence of complications of FMD in cattle was very high in terms of mortality and decreased production. So proper vaccination schedule need to control the disease

**Key word:** FMD, Prevalence, Clinical sign, Pathological lesion, management, Economic loss.

**CHAPTER - I**

**INTRODUCTION**

Foot & mouth disease (FMD) is a viral disease affecting the Cattle, buffaloes, sheep & goat for several countries. The causal agent was one of the first characterized viruses. It remains one of the most economically important viral diseases of farm animals that cause substantial reduction in productivity. It is a highly contagious disease that causes severe economic loss in terms of calf mortality & reduced productivity of the affected animals. Among infectious disease in Bangladesh, Foot and Mouth Disease is an endemic disease which is found year round although highest incidence occur mainly at the end of rainy season **(Rahman et al., 1988)**. The occurrence of the disease in draft cattle during land preparation has been contributing to a lot of sufferings of the farmers that lower crop production in locality. Types of FMD virus in Bangladesh were reported as types A, O, Asia-1 and subtype A22. The determination of economic losses that incurred from this disease in milk shed area would help in precise disease control planning by the farmers & government as well. The study describes an outbreak of FMD in domestic animals including cattle only & subtypes of virus found during the outbreak and the economic losses occur at Harirampur upozilla in four unions(eg; Chala, Boira, Gala, Sutaluri), Manikgonj district. The present study was designed to know the incidence of FMD in cattle and their clinical observation & management against the disease.

**Objectives of the study:**

1. To study the clinical observation and management of clinical case of FMD in cattle
2. To measure the incidence of FMD at Harirampur in four union (eg; Chala, Boira, Gala, Sutaluri), at Manikgonj district.

**CHAPTER- II**

**REVIEW OF LITERATURE**

FMD is an extremely contagious, acute disease of all cloven footed animals, caused bya virus & characterized by fever & vesicular eruption in the mouth & on the feet **(Blood & Radostits, 1989)**. The causal agent of this disease is a small, non-enveloped virus, a member of the Apthovirus in the family Picorna viridae. In Bangladesh out of 7 serotypes of virus only 4 types (O, A, C and Asia 1**)** has been demonstrated in endemic basis **(Islam et al., 1985)**

An important feature of FMD is that the virus may be recovered from the oropharynx for a varying period after in animal has been infected; if the period is longer than 28 days and the animal is classified as persistently infected or a carrier **(Brown et al.,1985).**

The main site where the virus persists in the epithelium of the dorsal surface of the soft palate.

Virus being transmitted from carrier cattle on susceptible cattle, for example, in Australia in 1871/72 and more recently in small ruminants in Saudi Arabia.

In Africa, the virus has transmitted experimentally from cape buffaloes to cattle.

FMD virus enters into the body either by inhalation or ingestion. If they pass into the blood stream and carried via the circulation to predilection site, under favorable condition and provided sufficient virus to the cells of the predilection site are invaded and the virus multiplies until the cells finally rupture resulting viraemia associated with excretion of virus from the respiratory tract and the feces, urine, semen, saliva, and milk **(Forman, 1978)**. Through semen the disease can be transmitted into other country (**Chowdhury et al., 1994**). Susceptible animals are infected with the diseases either by direct contact with infected animals or indirectly by contact with materials contaminated with virus.

The prevalence of this disease found throughout the year and the attack rate gradually increased from June to July.

Cross bred animal are more susceptible than local bred, FMD was significantly higher in cross breed (14.17%) compare to 9.87% in local breed (**Chowdhury et al., 1994**).

Animal that die may have grayish or yellowish streaking in the myocardium degeneration and necrosis. These findings are known as “tiger heart” **(Graham, 1959)** Changes may be noted in the pancreas and large intestine.

Following recovery FMD affected cattle show certain abnormalities. These are known as sequel to FMD. Panting is the common feature following FMD infection. This is suggested to be linked up with lesions in pituitary gland and thermoregulation. (Endocrine disturbance).Anemia overgrowth of hairs (Hypotricosis), mastitis (**Burrows et al., 1971**) and Diabetes mellitus are the other clinical features.

The economic importance of FMD as due to loss of productivity (25%) following infection (**Hussian et al., 1978**). Draft cattle cause serious problems in tillage and traction on which preparation of agriculture land is fully dependent. In dairy cows the most serious effects due to infections are loss of milk production, abortion, chronic mastitis.

A preliminary attempt to compute economic losses due to FMD reveals that the decreases in draft cattle cause working losses for about 12 days. The animal losses its body weight to about 9 kg, which is equivalent to 4 kg edible meat loss. Wage earning loss has been computed at about taka 144.00 per animal and draft energy wastage has been computed at 12.48 kw/ animal (**Rahaman et al., 1985**)

**FOOT AND MOUTH DISEASE (FMD)**

**Alternative names (Synonyms**)

1. Aphthous fever
2. Hoof-and-mouth disease
3. Epizootic aphthae
4. Infectious aphthous stomatitis

**Local Name:** Khura, Jhora, Bathna

**Virus classification (Leslile & Sussman, 1998)**

Group: Group4 (+Ve)ssRNA

Family: Picornaviridiae

Genus: Apthovirus

Species: FMDV

**Etiology of FMD (Blood & Radostits, 1989)**

Foot & Mouth diseases virus is a member of the genus apthovirus in the family Picornaviridae.

1. There are seven serotypes of FMDV: A, O, C, Asia 1, &Southern African Territories (SAT) SAT 1, SAT 2 & SAT 3.
2. Within these serotypes, over 60 subtypes have been described, & new subtypes occasionally arise spontaneously.
3. The importance of sub-types is that a vaccine may have to be tailor

Subtypes prevent in the area in which the vaccine is being used.

1. These serotypes show some regionally &the O is the most common.
2. The members of this family are small (25-30nm), non-enveloped isoheadral viruses that contains single-stranded RNA.

**EPIDEMIOLOGY**

1. **(a)** **Geographical distribution**
2. FMD is endemic in parts of Asia Africa, the Middle East, South America and parts of Europe.
3. Currently ,the OIE recognizes countries to be in one of three disease states with regards to FMD (1) FMD present with or without vaccination, (2) FMD free with vaccination and (3) FMD free without vaccination
4. Countries that are designated FMD free without vaccination have the greatest access to export market, so many developed nation, including Canada, north and central America, Australia, Newzeland, Japan, British island, currently have FMD free without vaccination status.

**2. (b)** **Host range (Blood & Radostits, 1989)**

1. Cloven footed domestic and wild animals (cattle ,buffalo ,yaks, sheep, goat, swine) are primarily affected .
2. Examples of other susceptible species are hedgesogs, armadillos, nutrias, elephants, capyvars, rats and mice’s.
3. Camelidae (camel, dromwdaries, llama,) have low susceptibility.
4. Horses are not susceptible to FMD, and human are affected only very rarely.

**Source of virus:**

1. Incubating and clinically affected animals Breathe, saliva, faeces and urine milk and semen (up to 4 days before clinical signs.)
2. Meat and by products in which PH has remain above 6.Carriers :particularly cattle and water buffalo, convalescent animals and exposed vaccinated(virus persists in the oropharyns for up to 30 month in cattle or longer in buffalo,9 month in sheep)
3. African cape buffalo are the major maintaince host of SAT serotype
4. Large amounts of virus are excreted by infected animals before clinical signs are evident, and winds may spread the virus over long distances.
5. Recovered cattle may be carriers for 18to 24 months, sheep for 1to2 months, and pigs are not carriers.

**Transmission (Fraser et al., 1991)**

1. Direct or indirect contact (droplets).
2. Animate vectors (humans etc.
3. Inanimate vectors (vehicles, implements).
4. Airborne, especially temperate zones (up to60km over land &300km by the sea.
5. The virus is highly contagious &may spread over greater distances with movement of infected or contaminated animals, products, objects and people.

**The FMD virus can be introduced into a free area by the following means (Blood & Radostits, 1989)**

1. Direct or indirect contact with infected animals.
2. Spread of aerosol from infected animals (requires proper humidity and temperature. Aerosol from bulk milk tracts spreads FMD in England. A person in contact with infected animals can have sufficient FMD virus in his or her respiratory tract for 24 hrs to serve as a source of infection for susceptible animals.
3. Feeding contaminated garbage (meat, milk, blood, glands, bones, cheese etc)
4. Contact with contaminated objects (hands, footwear, clothing)
5. Artificial insemination.
6. Contaminated biological such as hormones (extraction procedure may not activate the virus).

**Pathogenesis (Fraser et al., 1991)**

**FMD virus in nature**

Through inhalation or ingestion

Infect upper respiratory and alimentary tract

Replication

Primary vesicle in 1-4 days.

Viraemia and fever

Two days later

Secondary vesicle appears on stratified squamous epithelium or mucous membrane.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

Dorsum of tongue Lip Gum Dental pad Teat Interdigital cleft Placenta

Mastitis (**Radostits et al., 2007)** Lameness Abortion

Salivation

**Diagnosis:** FMD should be considered when ever salivation and lameness occurs simultaneously and a vesicular lesion is seen or suspected. Confirmatory diagnosis isolation and identification of FMD virus from infected animals.

1. Collection of sample/specimens.
2. Specimens: Oral, nasal, feet or mammary lesions good sources of specimens. The following should be collected from each of two or three animals.
3. vesicular fluid ( as much as possible)

2. Epithelium covering a vesicle (.5gm)

3. Flaps of epithelial tissue attached.

4. About 5 ml of blood with anticoagulant (viraemia ends about 5 days after the onset of disease).

* 1. Esophageal – pharyngeal fluid from convalescent cattle these should immediately be dilated with an equal volume of cell culture fluid and shaken vigorously for about one minute. If the solution turns yellow, the PH is low and the virus could be inactivated, discard and collect another sample.
  2. Blood for serum (10 ml of blood)
  3. From dead animals, collect sample of epithelial lesion, lymph node, thyroid, adrenal glands, kidneys and heart (10 gm).
  4. Full set of tissues in formalin.

Note: If specimens can be delivered to a laboratory within 24 hours, they should be placed on ice.

**Isolation and identification:**

1. Samples are prepared as a 10% suspension and inoculated into susceptible tissue culture and directly typed by CFT and ELISA. inoculation of primary bovine thyroid cell and primary pig, calf and lamb kidney cell, inoculation of BHK-21 and IB-RS-2 cell lines.
2. Isolated FMD virus is characterized by antigenic comparison with existing FMD vaccine strains.

**Virus isolation & cultivation:**

a. Cell culture study.

b. Mouse inoculation test-

Unweaned mice of 6-8 weeks old

Intraperitoneal inoculation of suspected sample

Paralysis of hindquarter and neck within 1-7 days

Death

Collect

Muscles of hindquarter and neck region

CFT,Cell and culture study.

**Serological study:**

1. ELISA
2. CFT
3. AGD then subtyping by VN test.
4. Other serology-FAT, Immuoperoxidse test.

**Differential Diagnosis (Blood & Radostits, 1989)**

|  |  |  |  |
| --- | --- | --- | --- |
| Points | Cattle | swine | Horse |
| FMDV | + | + | \_ |
| Vesicular stomatitis | + | + | + |
| Vesicular exanthema | \_ | + | + |

**Prevention and control:**

The official attitude of a country regarding control of a disease depends on how seriously the disease affects the country ,the financial and technical ability of the country, and what its neighbors are doing. The degree of control of FMD varies as follows:

1. Virtually no control in some Asian and African countries where FMD is enzootic.

2. Protection of valuable or accessible animals with vaccination along a border to provide a buffer zone (may vaccinate cattle because of severity of disease).

3. Large scale vaccination and quarantine with or without slaughter of infected animals.

4. Regulatory measures to prevent entry of FMDV and quarantine and implementation of an eradication program.

5. Vaccines:

a. Inactivated whole vaccine-FMDV vaccine must be produced from subtypes of virus closely related to those causing an outbreak.

-Polyvalent vaccine is usually prepared containing a mixture of prevalent serotype.

-Vaccination is usually repeated every 6-12 months.

-Adjuvant {like Al (OH)3} are necessary to enhance the immune response.

b. Sub-unit vaccine/Genetic engineering vaccine-using VP1

In an outbreak ‘ring vaccination’ with the relevant virus sub-type should be used to create a barrier of immune stock around the infected area.

**FMD Vaccine Produced by LRI, Mohakhali:**

1. Trivalent (A,O,Asia-1)---9ml S/C
2. Divalent---------------------6ml S/C Cattle above 6 months
3. Monovalent----------------3ml S/C

Immunity: 4-6 months.

**Eradication program for FMD free countries:**

1. Stop movement of animals and animals’ products.

2. Slaughter infected animals (and known contact animals)

3. Destroy carcass.

4. Perform vaccination.

5. Disinfected vehicles leaving the infected area.

6. Inform and educate the community.

**Vaccination** (**Radostits et al., 2007)**

1(a). Starting about 1951, FMD vaccine was produced by the Frenkel method.

1. Normal tongue epithelium was removed, minced, placed in a nutrient broth and inoculated with FMDV.
2. After replication of FMDV, the virus was inactivated with formalin and aluminum hydroxide was added as an adjuvant.
3. This method as well as virus propagation in cell culture is being used today to produce FMD vaccine.

2 (b). Today the classical FMD vaccines are prepared using binary ethylene mine(BEI) inactivated virus and aluminum hydroxide saponin or oil as an adjuvant

1. Double emulsion oil vaccines have been shown to produce an immunity of longer duration than aluminium hydroxide-saponin vaccine.
2. When vaccinating animals, it is important that the vaccine contain the same subtype of virus as in the area.
3. This necessitates frequent checking of the serotype and subtype during an outbreak because FMDV frequently changes during natural passage through various species.
4. Protection induced by good aluminum-hydroxide vaccine decreases rapidly in 4 to 6 months.
5. A double emulsion oil vaccine can protect for up to 1 year.

**Economic Importance** (**Rahaman et al., 1985**)

1. High communicability of the disease and decrease in milk and meat production.
2. Most cattle do not regain their weight and do not produce milk at their normal rates for the remainder of the lactation.
3. Valuable exports would also be lost due to other countries embargoing animal product.
4. Loss of draught power of animal.

**Public health significance:**

1. Since 1921 FMDV has been isolated and typed from slightly over 40 human cases.
2. The cases occurred on three countries: Europe, Africa and South America.
3. Type O pre dominant, followed by C and rarely A.
4. Because infection is uncommon, FMD is not considered being a public health problem.

**CHAPTER - III**

**MATERIALS AND METHODS**

**3.1 Study area:**

The study was conducted in Upazilla Veterinary Hospital at Harirampur, Manikgonj district where four(4) union( eg; Chala, Boira, Gala, & Sutaluri)were selected keeping the hospital centrally.

**3.2 Duration of the study:**

The duration of the study was 10 months from 5May, 2013 to 28 February, 2014.

**3.3 Sample size:**

Total 2950 animals were observed in Harirampur Upazilla, among four(4) unions eg; Chala=771, Boira=735, Gala=726, & Sutaluri=718 those are suspected and Chala=370, Boira=384, Gala=308, & Sutaluri=345 those were affected with FMD during 10 months.

**3.4 Case definition:**

FMD is an acute febrile viral disease of cloven footed animals.

**4.5 Method of collection:**

All the sick animals brought for treatment to the Upazilla Veterinary Hospital at Harirampur, Manikgonj were first registered in the patient registered book and the information was taken from VFA(veterinary field assistance) and AI volunteer of that respective union(eg; Chala, Boira, Gala, & Sutaluri) as well as from the oweners complaint were recorded. In addition to the registered patients of the Upazilla Veterinary Hospital cases treated at the different owners houses and farms were also recorded.

The age of each sick animal was determined by asking the owner and or by dentitions. A total of 2950 cattle were available during the 10 m0nths of period and the general clinical examination were conducted on the basis of disease history and owners complaint Final diagnosis was made on the basis of the interpretation of clinical, epidemiological findings.

**CHAPTER – IV**

**RESULTS AND DISCUSSIONS**

Incidence of FMD among four (4) unions at Harirampur upozilla, Manikgonj district is shown in Table 4.1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Name of the Union** | | | | | | | | | | | | |
| Months | Chala | | | Boira | | | Gala | | | Sutaluri | | | |
| Total observed | FMD  affected | Rate (%) | Total observed | FMD  affected | Rate (%) | Total observed | FMD affected | Rate (%) | Total observed | FMD  affected | Rate(%) |
| May | 72 | 31 | 43.06 | 68 | 25 | 36.76 | 63 | 22 | 34.92 | 60 | 28 | 46.67 |
| June | 90 | 85 | 96.44 | 95 | 82 | 86.32 | 87 | 42 | 48.28 | 90 | 53 | 58.88 |
| July | 83 | 35 | 41.18 | 78 | 30 | 38.46 | 72 | 32 | 44.44 | 60 | 25 | 41.67 |
| August | 70 | 32 | 45.71 | 65 | 26 | 40 | 68 | 31 | 45.59 | 62 | 22 | 35.48 |
| September | 68 | 28 | 41.18 | 60 | 22 | 36.67 | 63 | 28 | 44.44 | 70 | 31 | 44.29 |
| October | 75 | 30 | 40 | 70 | 35 | 50 | 72 | 26 | 36.11 | 74 | 32 | 43.24 |
| Nuvember | 96 | 52 | 54.17 | 90 | 63 | 70 | 92 | 56 | 60.85 | 95 | 61 | 64.21 |
| December | 71 | 22 | 30.99 | 73 | 42 | 57.53 | 68 | 23 | 33.82 | 70 | 38 | 54.29 |
| January | 66 | 25 | 37.88 | 62 | 31 | 50 | 71 | 20 | 28.17 | 65 | 30 | 46.15 |
| February | 40 | 30 | 37.5 | 74 | 28 | 37.84 | 70 | 20 | 40 | 72 | 25 | 34.72 |
| Total | 771 | 370 |  | 735 | 384 |  | 726 | 308 |  | 718 | 345 |  |

Table 4.1: Incidence of FMD at Cala, Boira, Gala and Sutaluri union.

Total 2950 animals were observed in my Upazilla, among four(4) unions eg; Chala=771, Boira=735, Gala=726, & Sutaluri=718 those were suspected and Chala=370, Boira=384, Gala=308, & Sutaluri=345 those were affected with FMD during 10 months.The incidence of FMD varied significantly in different unions with higher incidence at Chala union(94.44%) in June month and lower incidence at Gala union(28.17%) in January month due to season and other conditions.

Incidence of FMD varied significantly in different four (4) unions along with different months with higher and lower incidence is shown in Table 4.2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Name of the Union and its incidence rate (%) | | | | |
| Months | Chala(%) | Boira(%) | Gala(%) | Sutaluri(%) | Average(%) |
| **May** | 43.06 | 36.76 | 34.92 | 46.67 | 40.35 |
| **June** | 96.44 | 86.32 | 48.28 | 58.88 | **72.48** |
| **July** | 41.18 | 38.46 | 44.44 | 41.67 | 41.44 |
| **August** | 45.71 | 40 | 45.59 | 35.48 | 41.60 |
| **September** | 41.18 | 36.67 | 44.44 | 44.29 | 41.65 |
| **October** | 40 | 50 | 36.11 | 43.24 | 42.65 |
| **Nuvember** | 54.17 | 70 | 60.85 | 64.21 | 42.34 |
| **December** | 30.99 | 57.53 | 33.82 | 54.29 | 62.31 |
| **January** | 37.88 | 50 | 28.17 | 46.15 | 44.16 |
| **February** | 37.5 | 37.84 | 40 | 34.72 | **37.52** |
| **Average**(%) | **46.61** | **50.36** | **41.66** | 46.96 |  |

Table 4.2: Incidence (average) of FMD during 10 months of study.

Among 10 months, highest incidence rate was found in June month (Fig-1) average 72.48% which was higher than the finding of Rahman *et al*. Among cattle, FMD was found significantly (p<0.01) higher in average 47.63% and lower incidence rate was found in February month (Fig-1) average 37.52% which was lower than the finding of **Rahman *et al***.,**1985** in average 47.63%.

Fig-1: Incidence of FMD during 10 months of study

Nevertheless, the incidence in a specific animal species was higher than the finding of **Rahman *et al*.,1985** Among cattle e.g. in bull (51.74%), in cow (51.29%) and in calf (39.87%), which was also higher rate than average rate of Chala, Boira, Gala and Sutaluri union without calf .The percentage of incidence of FMD at different unions is shown at below in figure 2.

**Fig-2:** Incidence of FMD at Chala, Boira, Gala and Sutaluri union.

Among the four unions higher incidence (27%) was found in Boira union **(Fig-2)** and lower incidence (22%) was found in Gala union **(Fig-2)**.

The rate of infection among different groups of cattle confirmed the findings **Plotnikov,V.T., 1**972. 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 disease in the area. **Rahman et al., 2008** showed that prevalence of diseases in dairy cattle and their cross bred calves was 62.27% ,but in this study the incidence of FMD varied significantly in different unions with higher incidence at Chala union (94.44%) in June month and lower incidence at Gala union (28.17%) in January month due to season and other conditions.Such as the season before (e.g. June month) and after (e.g. November month) beef fattening program, farmer collects young underweight cattle from local market(eg: especially from Tepakhula market where cattle is brought from India) which are not vaccinated with FMD vaccine and even carefree to vaccinate the cattle after brought into house from the market.

**Clinical observations:**  The incubation period for FMD is 2-21 days depending on the infecting dose, susceptibility of the cost & strain of virus, although virus is shed before clinical signs developed.

1. Initial signs was fever of 104-106 F **(Blood & Radostits, 1989)** dullness, anorexia, shivering & reduction in milk production for 2-3 days, then.
2. Blisters (vesicles/apathies) appeared on the buccal & nasal mucous membranes including mouth, tongue, lips, followed by appearance of blister between the claws & coronary bands, even on the udder &teats.
3. After 24 hrs, ruptured of vesicles leaving erosion, and sticky, foamy, stringy saliva dropped from an animal’s mouth.
4. Painful mouth tongue lesions caused decrease in animals’ appetites resulting in weight loss.
5. Infection of the feet might lead to stamping or kicking of the feet, followed by lameness & are reluctant to move (**Radostits et al., 2007)**.
6. Pregnant cows might abort & young calves might die without developing any vesicle.
7. Recovery generally occurred within 2-3 wks but secondary might delay recovery.
8. Adult animals might suffer weight loss from which they did not recover for several months as well as swelling in the matured males & in cows, milk productions might declines significantly.
9. A lactating animal might not recover to pre-infection production because of damage to the secretary tissues.
10. Future milk production was also declined.

**Sequelae to FMD in cattle(Blood & Radostits, 1989)**

Tongue erosion, Secondary infection, Mastitis, Hoof deformation, Low milk production, overgrowth of hair and lack of heat toterance, Myocarditis & death in young, Unthriftiness failure to young, Breeding problem, Abortion, Painting-pituitary gland damage, Diabetes mellitus.

**Complications of FMD in cattle:** 1.Myasis 2.Hoof deformity 3. Lameness

**Mouth lesion (Vesicles/blister)**

1. A small blanched whitish area was developed in the epithelium.

2. Fluid filled area and a vesicles ( blister) were formed .

3. Vesicle enlarged and was coalesced with adjacent ones.

4. Vesicle was ruptured.

5. Vesicular covering sloughed off and left an eroded (red) area.

6. Epithelium was restored, but line of demarcation was remained, line then gradually fallen.

****

**Fig 1**: Drooling of saliva**. Fig 2:** A small blanched whitish area

**Feet lesions (Vesicles/blisters)**

The vesicles in the interdigital space were usually enlarged due to stress on the epithelium caused by movement and weight.

The lesion at the coronary band at first appeared blanched then; there was separation of the skin and horn.



**Fig:Ruptured vesicles in the interdigital cleft.**

**Clinical management**

1. With mild disinfectant and protective dressing to inflamed areas to secondary infection is recommended**(Blood & Radostits, 1989)**
2. The most common used disinfectants are 2% caustic soda, 5 % soda ash and 2% acetic acid&0.001%PPM.
3. Sulphadimidin or broad –spectrum antibiotics injections are useful to against the secondary bacterial infection for 5-7 days.
4. Antihistaminic injection should be given I/M for 3to5 days.
5. To relief pain we can use steroid/Non-steroidal anti-inflammatory drugs but pregnant animal could not use steroid drugs.
6. Application of borax after frying and mix with honey/molasses to apply tongue 2-3times daily until recovery.
7. To prevent fly repellents we can use turpentine oil to the erosion of interdigital cleft.
8. To prevent secondary infection of interdigital cleft we can apply

Antibiotic powder such as sumid vet ,dusting powder etc.

1. A good systemic response is reported to the administration of flunixin meglumine.
2. Application of sodibicarb to the eroded area in the Foot and Mouth.
3. When those animals affected in FMD may become very weak due to hampered of feed ingestion to recover this situation farmers can supply soft feed to the affected animals.

**CHAPTER - V**

**CONCLUSION**

Foot and Mouth Disease (FMD) is a highly contagious acute viral disease of all cloven-footed animals & characterized by fever and vesicular eruption in the mouth and on the feet.

The study was carried out during and after an outbreak of foot and mouth disease (FMD) in cattle at Harirampur upazilla, Manikgonj district for a period of 10 months (05-05-2013 to 28-02-2014). Result showed that the Percentage of FMD varied significantly in different in my Upazilla, among four(4) unions eg; Chala=771, Boira=735, Gala=726, & Sutaluri=718 those are suspected and Chala=370, Boira=384, Gala=308, & Sutaluri=345 those were affected with FMD during 10 months.The incidence of FMD varied significantly in different unions with higher incidence at Chala union(94.44%) in June month and lower incidence at Gala union(28.17%) in January month and higher percentage of incidence at Boira union(27%) and lower percentage of incidence at Gala union(22%) as well as highest incidence(72.48%) in June month and lowest incidence(37.52%) in February month was found during the period of ten month (5 May, 2013 to 28 February, 2014) due to season and other conditions.

A large no. of bull, cow & calves died of FMD and the financial loss incurred from this mortality. The economic losses due to calf mortality, reduced milk yield, draft power and poor body weight gain of fattening bull is seen.

It is very necessary to strongest the preventive measurement of FMD as holistic approach.

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