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Foot and mouth disease: Tracing recent presence in Nepal

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Abstract

Foot and Mouth disease is an extremely contagious viral disease affecting all the cloven footed animals and elephants. The purpose of this study was to perform an epidemiological analysis of FMD outbreak in Nepal. It is endemic in Nepal since the time immemorial as well as in South Asian countries. FMD is highly transmissible diseases that have the potential for very serious and rapid spread, which is irrespective of national border and are of serious economic consequences and is causing restrictions on international trade in animal products. Time and again, around 200 outbreaks of FMD have been reported in Nepal and is causing substantial economic losses of around Rs. 98, 806 per affected household directly by decreasing the production and change in herd structure, and indirectly losses by cost of FMD control. Thus, strict vaccination programme, quarantine, bio-security and awareness on basic nature of FMD to animal handlers could be the best approach. This paper is based on the review of different articles from various journals, magazines, epidemiological bulletin and reports from government of Nepal. The obtained information was thoroughly reviewed and its history, present status, diagnostic tools and prevention and control approach adopted was reanalyzed and summarized.

Keywords: Contagious, control, epidemiology, FMD, Nepal

1. Introduction

FMD is highly contagious, acute, febrile, viral disease of cloven footed animals. FMD was caused by Aphthovirus of Picornaviridae family ^[1]. FMD is endemic in Nepal. It has got high economic importance in case of farm animals and also wild animals are susceptible to this disease. It has high morbidity but low mortality rate (mostly seen in young animals) ^[2]. It is characterized by vesicular eruptions in and around mouth, nares, muzzle, teats and udder. Other symptoms include excessive salivation, high fever and lameness. In chronic cases this virus may cause anorexia, abortions, still birth and sore feet ^[2].

2. Etiology

FMD is caused by Aphthovirus of Picornaviridae family. It was considered to be the first animal pathogen which was identified as a virus and is the smallest one ^[1]. Seven different serotypes of FMDV have been identified which are O, A, C, Asia-1, SAT1, SAT2 and SAT3 ^[1]. However in Nepal, serotypes O, A, Asia-1 are predominant serotype A was reported in Chitwan and one outbreak of serotype Asia-1 was reported in Kaski ^[3].

3. Historical Background

3.1 Global History

The written description of FMD virus occurred in 1514 by Hieronymus Francastorius in Italy ^[4]. In 1780 in South Africa, Le Valliant described a disease in Cattle which attack the feet causing swelling, suppuration and sloughing off hoof ^[5]. In Germany, its existence was first reported in 1754 while in Great Britain in August 1839, in USA 1870 and in 1871 in South America ^[6]. Since 1872, Australia has been free of FMD and it was never reported in New Zealand. The disease was officially recorded in 1892 in South Africa except for that early history of FMD was not known in Africa and Asia. In 1898, Loeffler and Frosch discovered that there is a filterable virus behind the outbreak of FMD ^[7].

3.2 History of Nepal

In Nepal (1975), out of 30 elephants 16 were reported to have FMD who were travelling from Terai to Kathmandu on foot. It was reported that buffaloes who came in contact with these elephants were suffering from FMD [8]. FMD is endemic in Nepal due to import of cattle from India and also due to transition of cattle through Bangladesh [9]. On an average above 873 outbreaks per year have been reported from 2001-2010. During 2002, due to presence of FMD cases in Nepal, China refused Nepalese dairy product to enter into its country [10].

4. Situation of FMD in Nepal

FMD is a contagious disease listed in OIE Terrestrial Animal Health Code. Around Rs 98,806 economic loss is estimated per affected household [11]. However actual loss could be much higher if reduction in breeding efficiency and draught power of animals are to be added Nepal has been listed in pool-2 according to the report published by European Union of FMD [12]. Livestock population susceptible to FMD

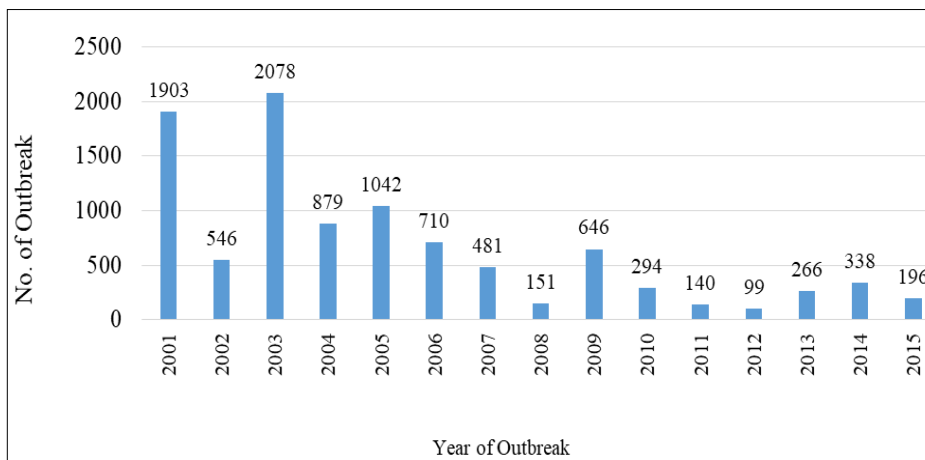
Table 1: Livestock Population in Nepal

Animal Species	Population (million)
Cattle	7.17
Buffalo	4.68
Goat	8.47
Sheep	0.8
Pig	1.04
Total	22.16

Source: Jha, 2010 [10]

The no. of FMD outbreaks, no. and species of animals, affected, dead, treated, vaccinated from all 77 districts are reported to Veterinary Epidemiology Centre (VEC) through existing passive surveillance system [13].

Year wise distribution of FMD outbreaks in Nepal during the period of 2001-2015, shows that highest outbreak was observed in the year 2003 likewise in the year 2001 about 1903 outbreak was reported. The reason behind this large no. of outbreak might be due to involvement of high virulent PanAsia of serotype O [13].

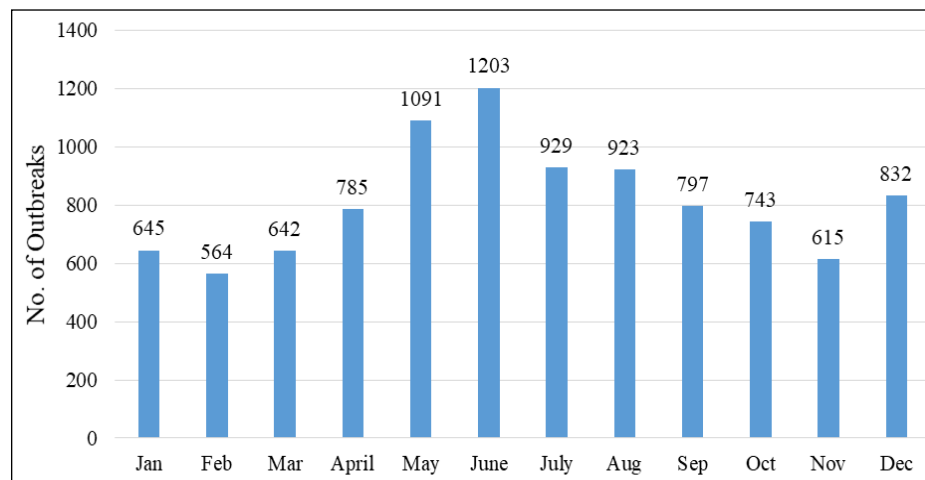


Source: Veterinary Epidemiological Center [13].

Fig 1: Year-wise distribution of FMD in Nepal (2001-2015)

Similarly, month wise distribution of FMD outbreak during the same period of 2001-2015, shows that highest number of outbreak was recorded during pre-monsoon and monsoon

period (May-August), although FMD outbreak occurred throughout the year.



Source: Veterinary Epidemiological Center [13].

Fig 2: Month wise distribution of FMD in Nepal (2001-2015)

FMD distribution by eco-zones from 2001-2015 shows that FMD outbreak was recorded highest in hilly region i.e. 4472 followed by Terai i.e.3342 and Mountain i.e. 1955. The

reason behind its high occurrence in hill region might be due to presence of highest number of ruminant populations [13].

Table 2: Ecozones- FMD Outbreak (2010-2015)

Ecozones	No. of Outbreaks	No. of animal infected	No. of death
Mountain	1955	74582	1094
Hill	4472	188275	3663
Terai	3342	103524	2106

Source: Veterinary Epidemiology Center [13].

Similarly, Development region wise distribution of FMD shows that the highest outbreak occurred in Central Development Region (9769 outbreaks) due to presence of large no. of livestock population and the lowest outbreak was recorded in Eastern Development Region i.e 1011, because of FMD control program launched there (Veterinary Epidemiological Center, 2016) [13].

Table 4: Ecozones- FMD outbreak (2016 Jan-July)

	No of outbreaks	No of susceptible	No of affected	No of dead animals	No. of vaccinated	No. of treated
Total	117	48393	5541	237	356378	5304
Mountain	13	3470	93	4	15322	89
Hill	70	3906	3336	114	128391	3222
Terai	34	41017	2112	119	212665	1993

Source: Veterinary Epidemiological Center [13].

On 2017 (April-May) 17 cattles and three buffaloes rearing in semi-commercial farms of Bharatpur-4, Chitwan, were affected. Laboratory study shows the causative agent was a new strain of serotype A, lineage V-II [14].

In April 2018, an outbreak of FMD occurred in Bageswari, Gaushala, Chitwan district, in which out of 150 animals 80 were showing characteristics FMD symptoms. The complete recovery of affected herd was observed after 45 days after immediate supportive treatment [2].

On 9th April 2019, a batch of 50 samples was received by the WRLFMD from Nepal. They had been collected from cattle (45), water buffalo (2), goats (2) and pigs (1) between April 2018 and March 2019. Forty-four were identified as FMD type O and six as NVD by ELISA and forty eight as FMDV GD and two as NGD by PCR [5].

5. Agro-terrorism

Agro terrorism is one of the malicious attempts which are done with the aim of destroying the agricultural products/ industry of the country through malicious use of plant or animal pathogen. OIE has listed FMD as one of the greatest potential agro terrorism threats [15]. Its high potentiality is due to its contagious nature which can get transmitted through inanimate objects and can get spread by wind [16]. United Kingdom which had been FMD free since 1967, experience a large outbreak in 2001 [15, 17]. This outbreak lasted for about 8 months with economic loss of about \$11 billion and about 12% of all livestock were slaughtered [18]. Another outbreak was reported in 2007 in UK [15].

6. Diagnosis

Diagnosis is based on history, clinical signs and symptoms like vesicles on oral cavity, teat region, and hooves. Signs of FMD may be confused with other diseases like malignant catarrhal fever, vesicular stomatitis, rinderpest, mucosal diseases so confirmatory diagnosis is done through laboratory findings and post mortem examination [7]. In Nepal, indirect sandwich antigen-ELISA (antigen and antibody) method is widely used for identification of FMD virus and PCR in

Table 3: Development Region- FMD Outbreak (2010-2015)

Development Region	No. of Outbreaks	No. of animal infected	No. of death
Eastern	1011	39692	362
Central	2253	65588	2805
Western	2216	72882	1415
Mid-Western	2109	92104	1318
Far-Western	2180	96115	1415

Source: Veterinary Epidemiology Center [13].

Species wise distribution of FMD outbreaks from 2000-2009 was highest in cattle (42%) followed by buffaloes (32%), goats (19%), sheep (4%) and swine (3%) [10].

The following table shows the six month report of FMD outbreak in the year 2016 between January-16 to June-16 according to the ecological belts of Nepal.

National FMD and TAD laboratory situated in Kathmandu [19].

7. Prevention and Control

Due to socio economic condition and religious reason, slaughter policy has not been adopted in Nepal. Vaccination program with quadrivalent vaccine is being practiced. Quadrivalent Vaccine (serotype O, A, C, Asia-1) was introduced in 2010 in Nepal. Vaccination is done at the age of 4 months and above followed by booster dose 1 month after first dose and subsequent doses once in every six month [2]. Ring vaccination program is performed in surrounding outbreak area.

In Kathmandu FMD Real Time Training Courses is held organized by FAO/EuFMD and Department of Livestock Services Nepal since 2012 [13]. Upcoming training course is going to be held on November 29 and then on December 6, 2019 [20].

8. Conclusion

FMD is one of the most globally important livestock diseases and is endemic in Nepal. It is causing restrictions on international trade in animal products. Important approach for prevention could be awareness program on basic features of FMD among livestock owners, dealers and traders including recognition of essential signs of disease and its serious consequences. Strict quarantine and bio-security could be the first line of defense. Vaccinations based on matching of a vaccine strain to a field strain are important approach.

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