Original Article
DOI: https://doi.org/10.70749/ijbr.v2i02.324

INDUS JOURNAL OF BIOSCIENCES RESEARCH
https://induspublisher.com/IJBR
ISSN: 2960-2793/ 2960-2807

Crossref

OPEN ACCESS

# Prevalence of Foot and Mouth Disease in Cattle of District Buner, Pakistan

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## ARTICLE INFO

### Keywords

Foot and Mouth Disease, Cattle of District Buner, Infectious Disease, Rhino Virus.

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### Declaration

**Author's Contributions:** All authors contributed to the study and approved the final manuscript.
**Conflict of Interest:** The authors declare no conflict of interest.
**Funding:** No funding received.

### Article History

Received: 11-10-2024
Revised: 24-11-2024
Accepted: 06-12-2024

## ABSTRACT

**Background:** Foot and Mouth disease (FMD) is infectious disease in cattle caused by a virus of the family Picornaviridae, also known as Rhino virus. The disease is characterized by large fever, appears lesions in the buccal cavity due to lesions in buccal mucosa the cattle face the difficulties in feeding. Affected animals have a high temperature, which is followed by the development of blisters chiefly in the mouth and on the feet. This disease cause loss of appetite, loss of weight, reduce milk production, miscarriage also occurs in this disease and sometime it may lead to death mostly in young ones. **Objective:** This study aimed to assess the Prevalence of Foot and mouth disease in district Buner. **Methods:** The present study was conducted on the Prevalence of Foot and Mouth disease in district Buner, Pakistan during August 2023 to August 2024. During the outbreak we were visited to the local community, DVM doctors. Livestock office of district Buner, veterinary assistance, Doctors etc. In this outbreak large number of economic loses were reported of FMD among the farmers community. **Results:** During the study a total of (n=3565) cases of animals (cattle) of Foot and mouth disease were reported, in which (n=439) (12.3%) death cases were reported. The total recovered cases of Foot and Mouth disease were (n=2817). During the outbreak there are around (36612) cattle were vaccinated in district Buner. The study area was divided into six different tehsils. **Conclusion:** The most affected tehsil during the outbreak was Mandanr. Tehsil Gadezi are highly effected in which (n=1105) cases were reported with mortality rate of (n=9.5%). The most rear effected tehsil was Gagra in which only (n=286) cases of FMD were reported with mortality rate (n=17.4%).

## INTRODUCTION

Foot and mouth disease (FMD) caused by the foot and mouth disease virus (FMDV) is an *Apthovirus* belonging to family *Picornaviridae* and consisting of seven discrete serotypes (O, A, Asia-1, C, South African Territories (SAT 1, 2 and 3)). These serotypes are reported frequently from one part or another part of the world. The low infectious dose of the virus, rapid replication, prolonged contributes to the rapid transmission of the virus to the susceptible animal population. The disease-causing ability of FMDV is different for different animals, which may depend on different factors such as the duration of virus present in the body, abrasion through which virus enters the body, and release of virus titer. Besides animal–animal transmission via respiratory aerosols, the virus is disseminated easily via mechanical routes, i.e., fomites, shoes, clothes, vehicles, and veterinary surgical instruments. Furthermore, the uncontrolled transboundary movements of animals have also aggravated its spread (Abubakar *et al.*, 2022).

Foot-and-mouth disease (FMD) is listed among the highly contagious diseases in animals and is endemic throughout the Asian continent. The disease is caused by the Foot-and-mouth disease virus (FMDV) and affects a wide variety of domesticated animals as well as wild ungulates. Clinically, the disease is described as a vesicular lesion on the tongue, muzzle, lips, gum, dental pad, interdigital cleft, coronary band, and heel of the foot. Sometimes these lesions give rise to lameness. Mastitis is also caused due to teat lesions (Aslamand Alkheraije., 2023).

Foot-and-mouth disease (FMD), caused by foot-and-mouth disease virus (FMDV), is an acute, febrile, and highly contagious disease of cloven-hoofed species, including domestic livestock such as pig, cattle, sheep, and more than 70 wildlife animals. FMD is listed as a "notifiable disease" by the World Organisation for Animal Health (WOAH). The disease is estimated to circulate in 77% of the global livestock population, posing enormous economic losses to the livestock industry and serious socioeconomic damages (Zhang *et al*., 2023).

Foot-and-mouth disease (FMD) is one of the most important contagious livestock diseases and has an important economic impact globally. FMD affects over 70 domestic (e.g., cattle, sheep, goats, and swine) and wild (e.g., African buffalo, gazelle) cloven-hoofed animals and exists in 7 serotypes (O, A, C, Asia1, SAT1, SAT2, and SAT3). The Horn of Africa hosts the FMDV serotypes O and A in order of prevalence the South African territories serotypes (SAT1 and SAT2) have been known to circulate in Ethiopia, Kenya, and Uganda In Uganda SAT2 and SAT1 have been identified from the African Buffalo in the Queen Elizabeth National Park and SAT3 was reported in Uganda in 2013. Serotype C has never been isolated from this region despite serological detection, and no clinical case of FMD caused by serotype C has been reported or detected over the last 15 years. FMD is estimated to circulate in 77% of the livestock population (Woldemariyam *et al*., 2023).

Body temperature of all experimental animals after vaccination remained within normal range when measured at 12 and 24 hours post vaccination (Jamil *et al*., 2015).

FMD is a widespread endemic disease in Pakistan. The government of Pakistan in collaboration with the Food and Agriculture Organization (FAO) of the United Nations is running a project on "Development of Framework for Progressive Control of FMD in Pakistan. The project mainly focuses on the development of the Disease Control Compartment (DCC) in the country, which has been planned in the Cholistan region of the Punjab province, where FMD mass vaccination is performed. The main purpose of developing DCC is to eliminate FMD from the defined territory and to gain access to the international food market, enhancing exports of the country Livestock and Dairy Development Department Punjab, 2017 (Ali *et al*., 2022).

Foot and mouth disease (FMD) causes severe economic losses to the livestock industry of endemic countries, including Pakistan. Pakistan is part of the endemic pool 3 for foot and mouth disease viruses (FMDV), characterized by co-circulating O, A, and Asia 1 serotypes, as designated by the world reference laboratory for FMD (WRL-FMD). FMDV serotype A lineage ASIA/Iran-05 is widespread in buffalos and cattle populations and was first reported in Pakistan in 2006. This lineage has a high turnover, with as many as 10 sub-lineages reported from Pakistan over the years (Naqvi *et al*., 2022).

Control strategy costs incorporated aspects of vaccination, surveillance, sanitary measures, program management, stakeholder engagement, preparatory studies, training, and capacity building. The results indicated a median benefit–cost ratio of 1.03 (90% central range 0.37, 1.63) with a median net present value of 1.99 billion Pakistan Rupees (90% central range −37.7, 37.0). The greatest cost was due to vaccination at 56%, followed by sanitary measures (including implementing and maintaining an animal ID system and quarantine stations around the zone) at 41%. Although the median benefit–cost ratio and net present value indicated that investment is likely to generate a positive return, the large variation indicates caution in interpreting the results and it is possible that an increase in animal value through new export markets will be required (Lyons *et al*., 2021).

## METERIALS AND METHODS

### Study Area

Buner is a district of Malakand division (Khyber Pakhtunkhwa, Pakistan). It consists of Tehsil Daggar, Gagra, KhudoKhail, Chagharzi, and Gadeze. The Daggar is The Head Quarter of the

District Buner lies between 34-09 and 34-43◦ N Latitude and 72-10 and 72-47◦ E Longitude. It is bounded on the North by Swat district, On the West by Malakand agency, On the South by Mardan district and on the East by River Indus, District Tor Ghar and Hazara Division. Elevation varies from 1200 Ft in Totalai in the South to 9,550 Ft of Dosara Peak. River Barandu is the largest river of the District Buner (Azeem *et al.*, 2023).

## Materials

Diagnosis of Foot-and-Mouth Disease in animals. The tissue of choice to take for sampling is vesicular epithelium or fluid. At least 1 g of epithelium should be placed in a transport medium of phosphate-buffered saline (PBS) or equal parts glycerol and phosphate buffer with pH 7.2–7.6. The data were collected from livestock department, DVM doctors, Animals medical centres, veterinary doctors. We were visited to all farms with in tehsils to investigate foot and mouth disease.

## RESULTS

The present study was conducted on the outbreak of foot and mouth disease in cattle of district Buner. The last outbreak occur from August 2023 to August 2024 in district Buner and still this disease was present in cattle but the ratio become reduce compare to Year 2023-2024. During this study a total of (n=3565) cases of foot and mouth disease in cattle become reported in which (n=956) (26.8%) death cases reported the total recovered cases of Foot and mouth disease were (n=2606). During this outbreak there are around (n=16612) cattle were vaccinated in district Buner. The study area was divided into six tehsils the most effected tehsil during this outbreak was Gadezai Tehsil. Gadezai are highly effected in which (n=1105) cases were reported with mortality rate of (n=30.9%). During the outbreak we were visited to the local community, DVM, Livestock office of district Buner, veterinary assistance, Doctors etc.

**Table1**

*Tehsil Wise outbreak of Foot and Mouth disease*

| S. NO | Tehsils | Reported cases | Recovered | Mortality | Vaccinations |
|---|---|---|---|---|---|
| 1 | Daggar | 481 | 362 | 35 (7.2%) | 4226 |
| 2 | Chagharzi | 312 | 256 | 24 (7.6%) | 6370 |
| 3 | Gadezi | 1105 | 907 | 110 (9.5%) | 9276 |
| 4 | Gagra | 286 | 206 | 50 (17.4%) | 5650 |
| 5 | Khudokhail | 405 | 270 | 90 (22.2%) | 6460 |
| 6 | Mandanr | 976 | 816 | 130 (13.3%) | 4630 |

In the above table1 showing the outbreak of Foot and Mouth Disease. The most highly effected Tehsil was Gadezi and rear effected tehsil was Gagra.

## Reported Cases

**Figure 1**

*Tehsil wise outbreak of foot and mouth disease*

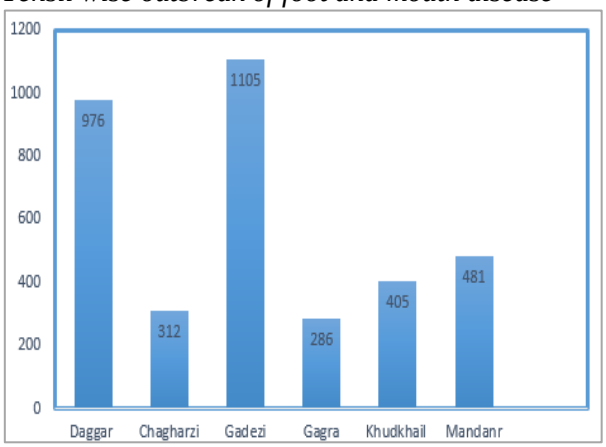



Table 1 represent the outbreak in district Buner about 3565 cattle were affected from Foot and mouth disease from July 2023 to December 2023. In the month of July a total cases of Foot and mouth disease were reported (n=17) with no mortality and (2215) vaccines were delivered to cattle. And the month of August the FMD cases were increasing and reached to (n=765) with mortality Rate(n=46) and (=10522) vaccines are delivered to cattle. And in the month of September the FMD cases further increased and total cases Reported in the month of September were Two thousand seven and forty (n=2740) with mortality rate (n=257). And (19560) vaccines are delivered to cattle and after the month of September the cases of FMD were decreasing and in the month of October two hundred and eleven(n=211) cases of FMD were reported mortality (n=32) and (4270) vaccines were delivered. And in the month of November the FMD cases were further decreased and a total (n=48) cases of FMD were reported with mortality rate (n=21) and (4825) vaccines are delivered in the month of December the Foot and Mouth disease become slow down up to (n=12) cases of FMD with no mortality rate (n=5) and (953) vaccines are delivered in the month of December.

**Table 2**

*Month wise reports of Foot and mouth disease.*

| S. NO | Months | Reported Cases | Recovered Cases | Mortality | Vaccinations |
|---|---|---|---|---|---|
| 1 | July | 26 | 26 | 00 | 1815 |
| 2 | August | 762 | 717 | 45 | 8250 |
| 3 | September | 2450 | 2100 | 350 | 19700 |
| 4 | October | 245 | 217 | 28 | 5100 |
| 5 | November | 71 | 57 | 14 | 1747 |
| 6 | December | 11 | 09 | 02 | 00 |
| | Total | 3565 | 2817 | 439 | 36612 |

**FMD Virus classication**

Domain Virus
Kingdom Orthornavirae
Phylum Pisuviricota
Class Pisoniviricetes
Order Picornavirales
Family Picornaviridae
Genus Apthovirus Species

Almost fever occurs almost one week later infection by the picorna virus.this initial fever may be exceed 106 fahrenheit (41 degree centigrade) and persist for one week.At this stage vesicles appears in the buccal cavity,lips and in the middle region of hoofs. The effect of picorna virus in which the disease is characterized by appear from seven to nine days after virus inoculation.

**Economic losses in the current outbreak in district Buner**

In the current outbreak around 36612 cattle were vaccinated, in the price one vaccine PKR 160. The price of total vaccine delivered to cattle in PKR is 5857920 and around 439 cattle were died during this outbreak; the average price per cattle in PKR is 150000. The total loss of died cattle around in PKR is 65850000. As shown in the table 4.4.

**Table 3**

*Representing the economic losses by Foot and Mouth Disease (FMD) tehsil wise in Pakisatni rupees (PKRS).*

| S. NO | Tehsils | Mortality | Price/Cow | Total economic loss by FMD per tehsil in (PKRS) |
|---|---|---|---|---|
| 1 | Daggar | 35 | 140000 | 4.9 M |
| 2 | Chagharzi | 24 | 140000 | 3.36 M |
| 3 | Gadezi | 110 | 140000 | 15.4 M |
| 4 | Gagra | 50 | 140000 | 7.0 M |
| 5 | Khudukhail | 90 | 140000 | 12.6 M |
| 6 | Mandanr | 130 | 140000 | 18.2 M |

**Treatment of FMD**

There is no specific antiviral treatment for FMD-infected cattle. The only treatment is supportive care for cattle. We can use pain killer, antibiotics like Septopersodium, Amoxiciline, Nixym, Amphiciline. And we also use Pottasium permanganate and Normal saline for washing wounds.

The following vaccines are used to treat Foot and Mouth Disease Pakisatn

1) Intervac vaccine
2) Enterovac vaccine
3) FUTVAC
4) FMD trivalent vaccine

**Figure 2**

*Intervac Vaccine*

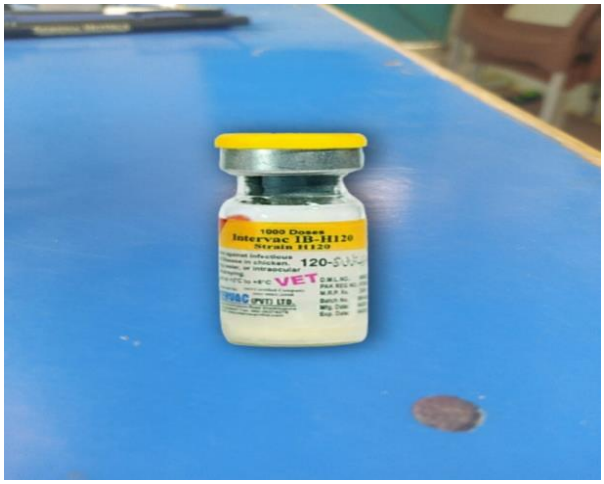



**Figure 3**

*Enterovac Vaccine*

**Figure 4**
*FUTVAC*


**Figure 5**
*FMD Trivalent Vaccine*


**Traditional Medicines**

Some peopleuse extracted water from onion for infected cattle massages. some people use sugar glucose for effected cattle Copper lotion pottasium lotion

**How to control Foot and Mouth disease**

For prevention and control these strategies are necessery.

1. Control Movement.
2. Wound Dressing/Cleaning.
3. Fever control.
4. Slaghter Campaigns.
5. Management strategies.
6. Vaccination.

**Figure 6**
*Effected Ox during outbreak*

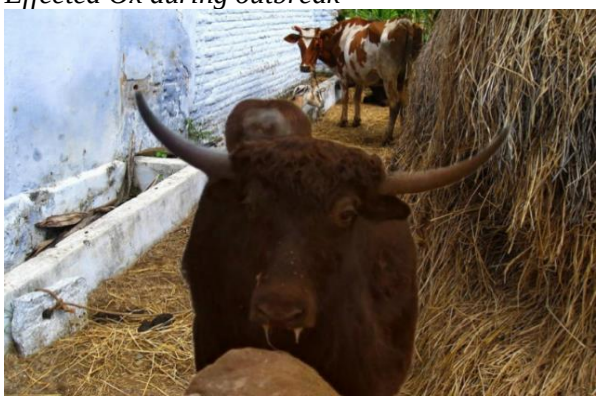
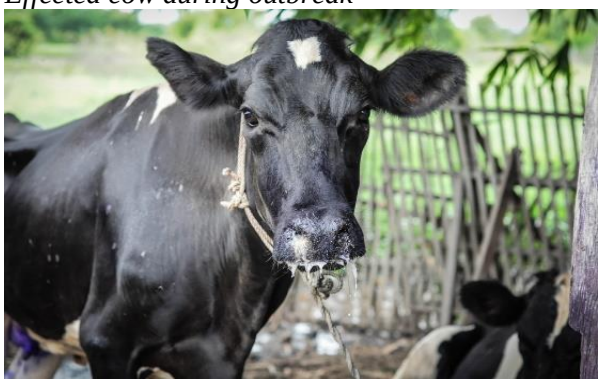


**Figure 7**
*Effected cow during outbreak*



**DISCUSSION**

The present study was conducted on the outbreak of Foot and Mouth Disease in district Buner during August 2023 to December 2024. During the study a total (n=3565) cases of cattle of Foot and Mouth Disease were reported in which a total of (n=439) (12.3%) death cases were reported. The total recover cases of Foot and Mouth Disease were (2817). During this outbreak there are around (36612) cattle were vaccinated in district Buner. The study area is divided into six tehsils. The most effected tehsil during this outbreak was Gadezi. Tehsil Gadezi are highly effected in which (n=1105) cases were reported with mortality rate of (n=9.5%). The most rear effected tehsil during this outbreak was Gagra in which only (n=286) cases of FMD were reported with mortality rate of (n=17.4%). During the outbreak we have visited the local community, DVM doctors, Livestock office of district Buner, veterinary assistance, Doctors etc. In this outbreak a large number of

economic losses were reported in the farmer's community. There are also banned on meat and milk during this outbreak of Foot and Mouth disease.

Abubakar *et al.,* 2013 This study describes epidemiological characteristics of the foot and mouth disease (FMD) outbreaks in different areas of Pakistan, including the pattern of the outbreak in both time and space, transmission routes among infected areas, and control measures. One of the prominent features of these FMD outbreaks was that the virus infected mostly cattle and Buffaloes despite the presence of other susceptible animals (Sheep and Goats). The other significant feature of each outbreak was the mortality, which was 7.74% and 13.87% in the adult animals and young stock, respectively. Overall, morbidity rate was 64.19% as compared to mortality rate which was 21.61%.

In our study of Foot and mouth disease in district Buner represents the data of district Buner of Khyber Pakhtunkhwa, Pakistan, from September 2023 to March 2024. In our study a total of 36612 cases of foot and mouth disease were reported in district Buner with tehsil wise and a total of 439 deaths were reported overall mortality rate was 12.3%. The highest mortality rate is 22.2% in tehsil Khudokhail. Tehsil Gadezi had highest cases of Foot and mouth disease is 1105 with mortality rate 9.5% Ali *et al.,* 2022 FMD outbreaks between January and April 2019 in the Punjab province. The FMD outbreaks started during the month of January, culminated in February (n = 36, 56.25%) and stopped during the month of April 2023. The most common serotype was O (45.83%), followed by Asia1 (29.17%) and A (13.89%); however, some case farms had mixed infection with serotypes A and O (9.72%) and serotypes O and Asia1 (1.39%). Multivariable analysis revealed that the history of introducing a new animal with unknown FMD vaccination status in the herd (OR =11.51, 95% CI = 3.28 – 40.47), not practicing regular vaccination against FMD (OR = 20.81, 95% CI = 4.59 – 94.35), history of the visit of an animal broker (OR = 9.06, 95% CI = 2.31 – 35.61), distance of the farm to a nearby livestock farm (OR = 6.13, 95% CI = 1.39 – 27.01) and large herd size (OR = 20.79, 95% CI = 2.45 – 176.27) were significantly associated with the occurrence of FMD outbreaks in Punjab province during 2019. In conclusion, improving bio security measures, avoiding the introduction of animals without FMD vaccination history and regular vaccination against FMD can significantly reduce the occurrence of the disease on livestock farms in Pakistan.

FMD is susceptible to cattle of all ages however young cattle have hardness and strong immune system against FMD than the aged cattle and the little calf**.**

In recent study in district Buner, we collected data by visiting to farms, and farmers. The reported are varied in all tehsils of district Buner, collected from August 1, 2023 to August 31, 2024.The total cases reported from six tehsil of district Buner was 3565, out of the total infected2817 cases were recovered and 439 cattle were died. Out of all six tehsils, the highest affected Tehsil was Gadezi, in which 1105 cases were reported with mortality rate 9.5%. The lowest mortality rate was 7.2% recorded from tehsil Daggar, and the highest recovery rate was 83.6% recorded from tehsil Khudokhail.

Jamal *et al*., 2010 the present study reports the distribution of different serotypes of foot-and-mouth disease virus (FMDV) in Pakistan during the period 1952-2007. During this time, a total of 1,543 epithelial samples out of 2,484 tested were found positive for various serotypes of FMDV. Serotype O was found to be the most prevalent ($p < 0.001$) followed by serotype Asia-1 and A. Serotype C was detected only in 1954, 1963 and 1995. The disease was found to be more prevalent ($p < 0.0001$) in cattle than buffaloes. The geographical distribution of 153 laboratory confirmed FMD outbreaks from 2002 to 2007 and the serotypes of the virus involved has been mapped. Higher number of outbreaks of the disease was noted between the months of January to March during this period, which may be attributed to the livestock movement in the country particularly due to religious festival, EidulAzha, in which the animals are sacrificed.

## CONCLUSION

In our research a total of (n=3565) cases of animals (cattle) of Foot and mouth disease were reported in which (n=439) (12.3%) death cases were reported. The total recovered cases of Foot and mouth disease were (n=2817). During the outbreak there are around (36612) Cattle were vaccinated in district Buner. The study area was divided into six

different Tehsils. The most affected tehsil during the outbreak was Gadezi. Tehsil Gadezi are highly effected in which (n=1105) cases were reported with mortality rate of (n=9.5%). The most rear effected tehsil was Gagra in which only (n=286) cases of FMD were reported with mortality rate (n=17.5%).

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