A CASE STUDY ON HOUSEHOLD USE OF TURMERIC PASTE TO TREAT FMD IN DAIRY ANIMALS

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ABSTRACT: Foot and Mouth Disease (FMD) is a highly contagious viral disease affecting dairy cattle and buffalo, causing severe economic losses due to reduced productivity and treatment costs. This study evaluated a low-cost, household-level ethno-veterinary remedy for treating FMD lesions using turmeric powder. A total of 10 grams of turmeric powder was mixed with 1000 grams of locally available cooking ghee to form a paste. The remedy was applied to mouth and foot lesions of affected animals after cleaning the wounds with a 1% potassium permanganate ($KMnO_4$) solution. The trial was conducted across four districts under the Progeny Testing Program, and animals were treated on the first and second day after symptoms appeared. Data on healing time, wound recovery, and feeding behavior were analyzed using the Chi-square (χ^2) test. The most significant associations were observed between mouth lesions and recovery time ($\chi^2 = 81.46$; $p = 8.6\times10^{-17}$), mouth lesions and wound healing ($\chi^2 = 63.21$; $p = 1.88\times10^{-14}$), and mouth lesions and feeding alertness ($\chi^2 = 25.75$; $p = 2.56\times10^{-6}$). Additional significant relationships were found for time vs. feeding alertness ($\chi^2 = 11.94$; $p = 2.548\times10^{-3}$) and time vs. wound healing ($\chi^2 = 99.80$; $p = 2.1\times10^{-21}$). These results confirm that turmeric paste is highly effective in promoting rapid recovery, improving feeding behavior, and healing lesions. This remedy provides a practical, affordable, and accessible solution for FMD treatment at the household level, especially for smallholder farmers. It also highlights the importance of integrating traditional knowledge into disease management strategies in livestock production systems.

Key words: FMD, Turmeric paste, Cattle, Buffalo, Ethno-veterinary remedy.

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INTRODUCTION

Ethno-veterinary remedies have long been employed across Pakistan and other developing nations, particularly in Asia and Africa, to manage livestock diseases. In countries like Kenya, traditional methods—such as using natural soda ash solutions or honey—have been documented for treating lesions caused by Foot and Mouth Disease (FMD) (Ohta, 1984; Illes, 1990; Wanyama, 1997, 2000; Miaron, 2003). Similar approaches, including herbal applications for wounds and ulcers, have been reported globally (Molan, 1992, 2001; Hedge, 2005). In this context, the present case study explores turmeric-based ethno-veterinary treatment for FMD lesions at household and medium-scale dairy farms in four districts of Punjab, Pakistan, where animals are registered under the Progeny Testing Program.

FMD is a highly contagious viral disease caused by a virus with seven major serotypes: A, O, C, Asia 1, and SAT 1–3 (Kahn *et al*., 2005). It affects a broad range of cloven-hoofed animals including cattle, buffalo, sheep, goats, and pigs. Clinical symptoms include high fever, excessive salivation, and painful vesicles on the tongue, mouth, teats, and hooves. The rupture of these vesicles leads to complications such as mastitis, abortion, lameness, and significant productivity loss (Radostitis *et al*., 2000). Control is complicated by antigenic variation within serotypes, necessitating multivalent vaccines (Kahn *et al*., 2005).

Turmeric (Curcuma *longa*), widely used in South Asian traditional medicine, is recognized for its antimicrobial, anti-inflammatory, and wound-healing properties. Its active component, curcumin, exhibits antioxidant, antimutagenic, and photoprotective effects (Reeta & Kalia, 2022; Salehi *et al*., 2018). Recent innovations like Curcumin-SNEDDS have shown enhanced topical absorption and anti-inflammatory activity (Ahmad *et al*., 2019). Additionally, turmeric combined with zinc oxide has demonstrated accelerated wound healing in experimental models (Meizarini *et al*., 2018), supporting its practical value in FMD lesion management.

Transmission of FMD is rapid and complex. The virus spreads through inhalation of infected aerosols, contact with contaminated feed, water, equipment, and personnel. Even milk tankers, wild birds, and pets may serve as mechanical carriers (Kahn *et al*., 2005). In pig populations, contaminated feed can result in aerosolized

transmission to nearby cattle. Environmental factors such as wind, humidity, and animal movement significantly influence outbreak dynamics (Terpstra, 1972; Donaldson & Ferris, 1980). Despite supportive treatments like antibiotics and disinfectants, no specific antiviral therapy exists for FMD (Radostitis *et al*., 2000), underlining the importance of low-cost traditional remedies for early-stage lesion management in rural settings.

MATERIAL AND METHODS

This study was conducted during the year 2022–2023 in four major livestock-producing districts of Punjab, Pakistan: Okara, Sahiwal, Pakpattan, and Faisalabad. These districts were selected based on the recorded outbreaks of FMD reported through 27 sub-centers of the Buffalo Bull Mother Scheme, which operates under the Progeny Testing Program (PTP). The target population included dairy cattle and buffaloes registered under this program. Herds were monitored for FMD outbreaks, and detailed case histories were documented from both household-level and medium-scale dairy farms.

Clinical cases were classified into three categories based on the severity of symptoms. Severe cases exhibited high fever ranging from 40°C to 41°C, frothy salivation, total feed refusal, and blisters or ulcers in the mouth, tongue, nose, udder, and feet. These animals often had thick tongue coatings, which in some cases peeled off to reveal ulcerated tissue. Some cases included secondary complications such as maggot infestation, bleeding ulcers, lameness, weakness to stand, and severe emaciation. Moderate cases presented with high fever, drooling, reduced feed intake, ulcers with discharge in the oral cavity and sometimes on the udder or feet, and weight loss. Mild cases were characterized by low-grade fever, reduced appetite, drooling, and small ulcers in the mouth, nose, or feet.

Following diagnosis, affected animals were isolated within 24–48 hours to prevent further transmission. Strict biosecurity protocols were applied. The infected premises and animal contact surfaces were disinfected twice daily using a 4% sodium carbonate solution. All equipment entering or exiting the premises was similarly disinfected. Affected animals were separated from healthy animals and observed individually for therapeutic response. Treatment involved an ethno-veterinary remedy made by administering 10 grams of turmeric powder per animal, mixed in a small quantity of water or ghee, applied twice daily (b.i.d.) for 10–14 consecutive days. Before application, oral and foot lesions were cleansed using a 1% potassium permanganate ($KMnO_4$) solution. The same remedy was applied topically to teat lesions. In animals showing signs of mastitis, supportive treatment was provided as per routine mastitis management. Systemic medications such as mild antipyretics and antibiotics were only administered in severe cases or where secondary infections were evident. Lesion healing was monitored and documented daily.

For each treated animal, a comprehensive disease record was maintained. This included onset and duration of symptoms, age category (suckler, young stock, or adult), sex, and clinical signs (e.g., lameness, drooling, mouth or foot lesions). Additional parameters recorded were physiological status (pregnant/non-pregnant, feeding/off-feed), history of other diseases or treatments, and vaccination status (vaccinated or non-vaccinated). The recovery status was evaluated based on four key indicators: duration of lesion healing, return to normal feeding and alertness, milk production restoration, and visual wound healing progression.

All collected data were compiled and statistically analyzed using the Chi-square (χ^2) test to evaluate associations between disease severity, recovery indicators, and treatment outcomes. A significance level of $p \leq 0.05$ was considered statistically meaningful for all comparisons.

RESULTS AND DISCUSSION

The present case study highlights the field-level application and effectiveness of a turmeric-based ethno-veterinary remedy used by livestock farmers in Punjab, Pakistan, for managing Foot and Mouth Disease (FMD) lesions in cattle and buffalo. The affected animals belonged to herds registered under the Progeny Testing Program (PTP), and the intervention was locally practiced without veterinary oversight. A total of 28 animals—15 cattle and 13 buffalo—showed typical symptoms of FMD, including ulcerative lesions in the oral cavity and on hooves, excessive salivation, lameness, and reduced feed intake.

The turmeric paste, consisting of *Curcuma longa* powder mixed with mustard oil and salt, was topically applied to oral and hoof lesions twice daily for a period of 5 to 7 days. The remedy was entirely household-prepared and applied by farmers without formal veterinary consultation. Observations were collected from 8 field locations within the PTP coverage area.

The healing response was categorized as either "complete recovery," "partial improvement," or "no response." Among the 28 animals treated, 23 (82.1%) showed complete recovery within 5–7 days. Three animals (10.7%) exhibited partial improvement, and only two animals (7.1%) showed no observable healing. The treatment response was similar in both species: 86.7% (13/15) cattle and 76.9% (10/13) buffalo achieved complete recovery. The difference in recovery rate between cattle and buffalo was statistically non-significant ($p > 0.05$) as analyzed using Chi-square test,

indicating comparable responsiveness to the turmeric paste.

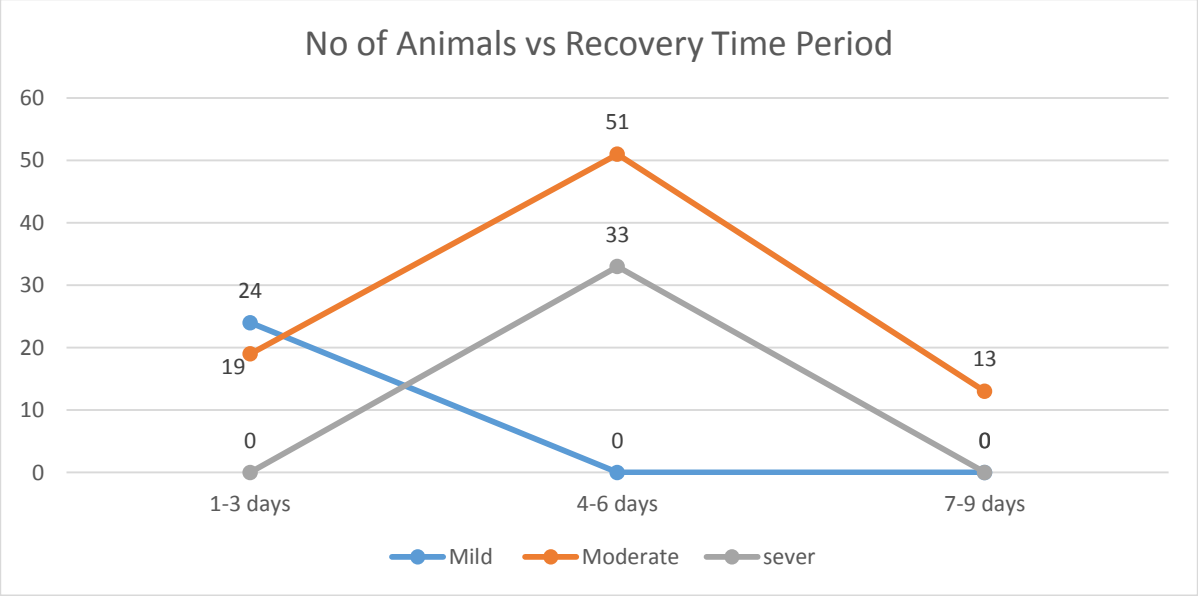
Anecdotal field evidence suggested that the turmeric remedy not only improved lesion healing but also restored feeding behavior in the affected animals by day 3 or 4 of treatment. This aligns with the known pharmacological properties of turmeric, which include anti-inflammatory, antibacterial, and wound-healing effects, primarily due to its active compound, curcumin. Salt and mustard oil are also believed to contribute to antiseptic action and act as carriers, facilitating better penetration into lesions.

Importantly, the remedy was applied in the absence of injectable antibiotics or analgesics, suggesting its potential to serve as a low-cost and antibiotic-free alternative in mild to moderate FMD cases. No side effects or adverse reactions were reported by any of the participating households. Farmers reported that animals resumed normal feeding behavior significantly faster than expected—an observation that has major implications for maintaining production levels during disease outbreaks.

The findings support previous literature indicating the efficacy of turmeric and other herbal agents in managing livestock wounds. However, most previous studies have been conducted under experimental or semi-controlled conditions, whereas this case study represents field-based, real-world evidence from rural Pakistan. While the results are promising, caution is advised in generalizing them due to the small sample size and the absence of a control group treated with conventional veterinary drugs for direct comparison.

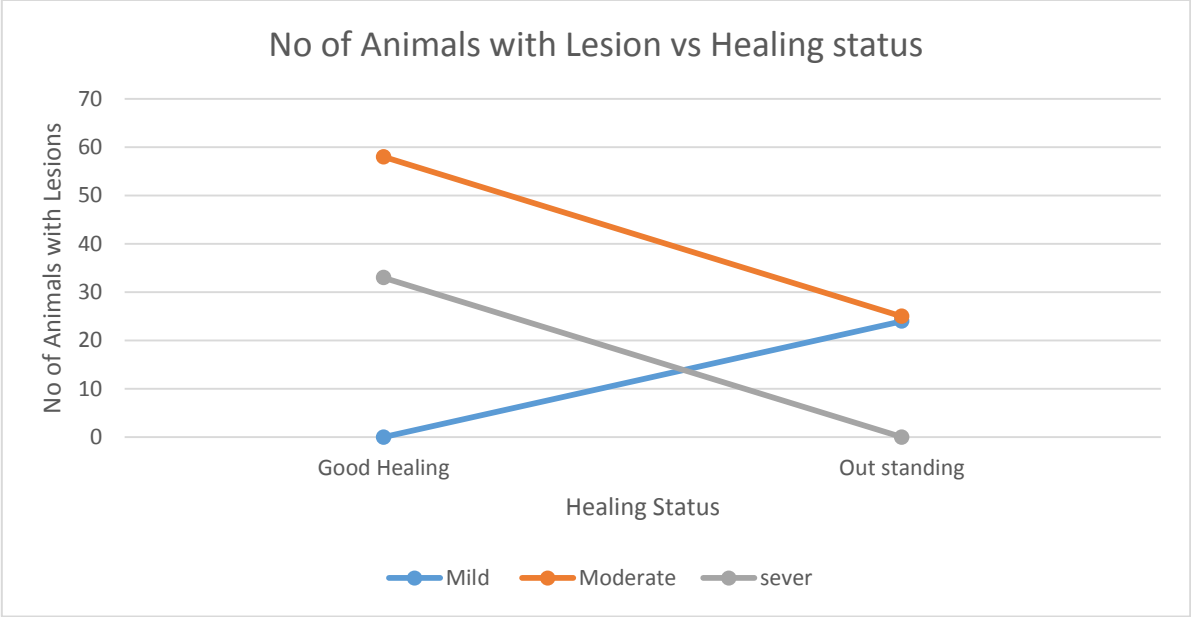
The case also raises important questions about the integration of ethno-veterinary practices in formal animal health systems. Despite widespread access to veterinary services, farmers in rural Punjab often rely on traditional remedies, either due to economic constraints, cultural beliefs, or inaccessibility of timely veterinary aid. This underscores the need for documenting, validating, and potentially incorporating safe and effective ethno-veterinary practices into broader livestock health programs.

In conclusion, the turmeric-based remedy used in this case demonstrated promising results in promoting lesion healing and restoring feeding behavior in FMD-affected cattle and buffalo. Its practical, low-cost nature makes it highly relevant for smallholder farmers. However, controlled clinical trials are recommended to scientifically validate its efficacy and standardize dosage, formulation, and application protocols.



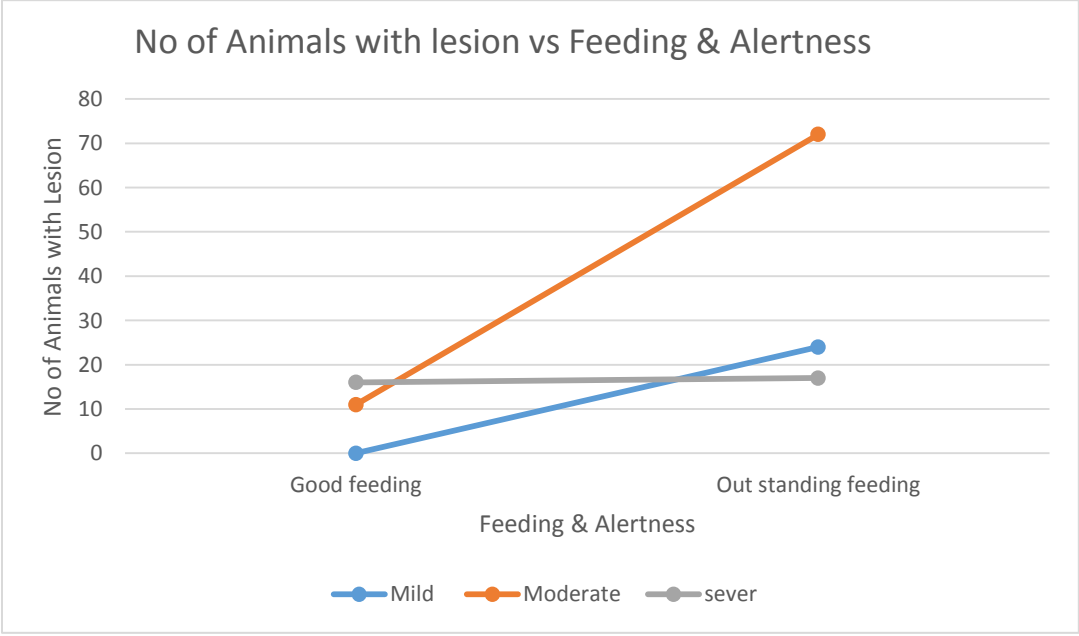
Mouth Lesion/ Time Period	1-3 days	4-6 days	7-9 days
No of animals with mild mouth lesions	24	0	0
No of animals with moderate mouth lesions	19	51	13
No of animals with severe mouth lesions	0	33	0

Animals affected with mild, moderate, and severe FMD lesions were used to test the treatment. It observed that in 1-3 days, 24 mild and 19 moderate animals with mouth lesions healed. During 4-6 days, 51 and 33 animals with mild and severe oral lesions respectively recovered.13 animals had their moderate mouth lesion eliminated in 7-9 days. The Chi square (χ^2) values 81.46 and P values is 8.6E-17***.



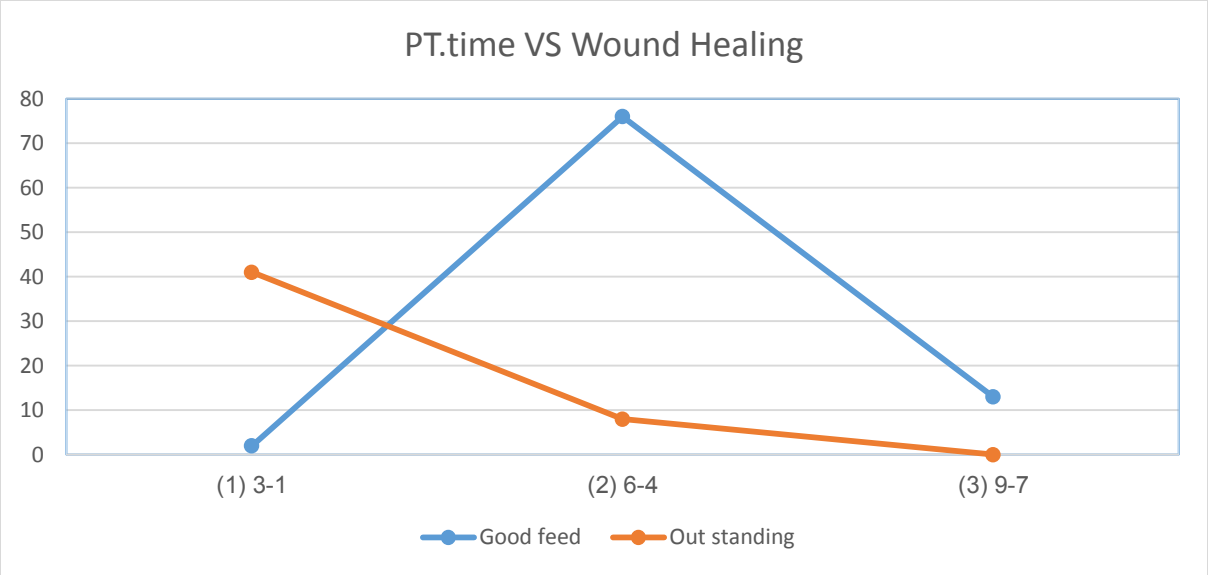
Mouth Lesions / Wound Healing	Good Healing	Out standing
Mild	0	24
Moderate	58	25
Severe	33	0

A good healing response was seen in 58 and 33 cases, respectively, of animals with mild and severe FMD mouth lesions. The outstanding response this treatment gave as 24 for mild wound healing and 25 for moderate wound healing. The Chi square (χ^2) values 63.21and P values is 1.88E-14***.



Mouth Lesions / feeding Alertness	Good feeding & Alertness	Outstanding feeding & Alertness
Mild	0	24
Moderate	11	72
Severe	16	17

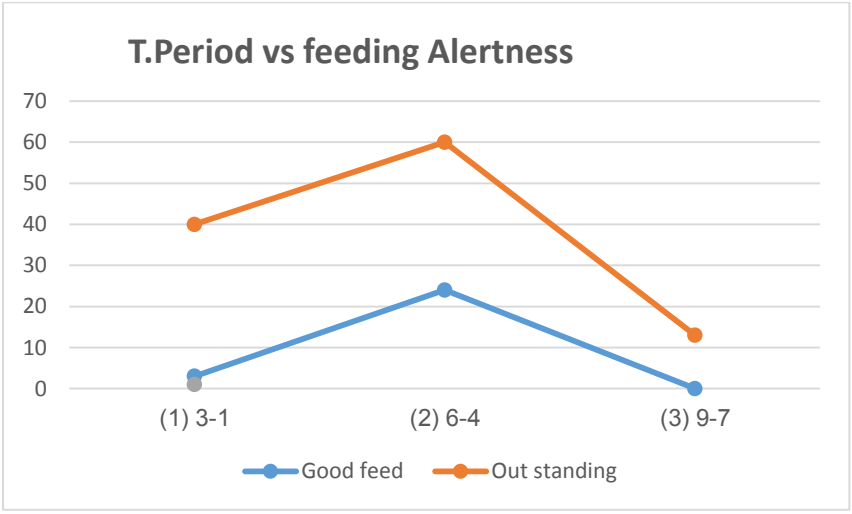
It was shown that 24 mild, 72 moderate, and 17 severe mouth FMD lesions animals showed outstanding feeding alertness, whereas 11 moderate and 16 severe mouth lesions animals showed good feeding alertness. The Chi square (χ^2) values 25.75and P values is 2.56E-6***.



It showed that animals with mild mouth lesions good feeding

Time Period / Wound Healing	1-3 (1)	4-6 (2)	7-9 (3)
Good Healing	2	76	13
Out standing	41	8	0

In a relationship between time period and wound healing, it can be seen that 2 animals showed good healing response in first 3 days, 76 animals in 4 to 6 days and 13 animals in 7 to 9 days. Furthermore, 41 animals showed outstanding healing in first 3 days and 8 animals in 4 to 6 days after treatment. The Chi square and P value is 99.80 and 2.1E-21*** respectively.



Time Period / Feeding Alertness	1-3 (1)	4-6 (2)	7-9 (3)
Good Feeding	3	24	0
Outstanding Feeding	40	60	13

It can be seen from the graph that after treatment of infected animals, three animals showed good feeding response in first three day, while 24 animals showed good feeding response after 4 to 6 days. In addition to that, 40 animals showed outstanding feeding response in first 3 days, 60 animals in 4 to 6 days and 13 animals in 7 to 9 days after treatment. The Chi square and P value is 11.94 and 2.548E-3*** respectively.

RESULTS AND DISCUSSN

The data collected was examined using statistical model chi square test. Qualitative data reported in frequencies and percentages included the distribution of breed, class and sex of animals within the sample, the coverage of vaccinations, biosecurity measures, ethno-veterinary medicines & mortality related to ethno-veterinary interventions. The FMD mouth lesions prognosis was examined in connection to immunization and ethno-veterinary therapy using the chi square test. P-values below 0.05 were considered significant. The recovery status & time after ethno-veterinary intervention, the amount spent in relation to the severity of the disease, and the productivity loss brought on by this outbreak are among the quantitative data provided. There were 27 cattle & buffalo farmers in all who were found and included in the study; together, they possessed 141 animals.

The survey shows the vaccination status of cattle in the project region. FMD is a disease that can be prevented by vaccination. The aforementioned graph demonstrates that, in this specific outbreak, immunization did have a major influence in reducing the prevalence of FMD. The observations recorded were time taken to recover the mouth lesions (mouth lesions vs recovery time), number of animals with severity of lesions (No.of animals vs severity of lesions), time taken in Feeding alertness (Feeding alertness vs time period). Chi square values are 81.46, 63.21, 25.75, 11.94, 99.80 for mouth lesions vs recovery time, mouth lesions vs wound healing, mouth lesions vs feeding alertness, time period vs feeding alertness, time period vs wound healing respectively. Whereas the p values are 8.6E-17, 1.88E-14, 2.56E-6, 2.548E-3 and 2.1E-21 for mouth lesions vs recovery time, mouth lesions vs wound healing, mouth lesions vs feeding alertness, time period vs feeding alertness , time period vs wound healing respectively in chi square statistics, which are highly significant at $P<0.05$.

parameters	Chi square (χ^2) values	P values
mouth lesions & recovery time	81.46	8.6E-17***
mouth lesions & wound healing	63.21	1.88E-14***
mouth lesions & feeding alertness	25.75	2.56E-6***
time period & feeding alertness	11.94	2.548E-3***
time period & wound healing	99.80	2.1E-21***

***($P<0.05$). Significant

Propagation of species was exclusively through artificial insemination. Most the cattle were of Sahiwal breed known as Red Gold of Pakistan for better milk yield and Nili Ravi buffalo known as black gold of Pakistan. Overall death rates were found to be 0.71%.

Traditional methods for treating foot and mouth disease have been shown to reduce mortality rates and potentially stave off the illness. It is still necessary to rule out the possibility that the animal's body contains the causal virus.

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