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Community-Based Surveillance Enables One Health Response to Foot and Mouth Disease Outbreak in Rajshahi, Bangladesh – 2023

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Abstract

Foot and Mouth Disease (FMD) is a highly contagious viral illness affecting cloven-hoofed animals and causing significant economic losses in Bangladesh. In November 2023, an FMD outbreak in Rajshahi City Corporation was identified through Community-Based Surveillance (CBS). This report documents the One Health response triggered by this CBS alert. Field records from CBS and were used to describe the outbreak response. The investigation included: (1) outbreak detection and laboratory verification; (2) risk communication and community engagement; (3) an emergency two-phase vaccination campaign; and (4) data recording and monitoring. A joint team involving Institute of Epidemiology, Disease Control and Research (IEDCR), Bangladesh Red Crescent Society (BDRCS), the Department of Livestock Services (DLS), and Rajshahi health authorities led the intervention. Early detection by a community volunteer on 10 November 2023 led to rapid confirmation of FMD by the Bangladesh Livestock Research Institute (BLRI). Risk communication was promptly launched, using culturally adapted materials and interpersonal messaging to promote awareness, safe practices, and trust. The emergency vaccination campaign reached 217 cattle across two phases (December 2023 and February 2025) and achieved full coverage of identified at-risk animals with no adverse events reported. Data recording was maintained throughout, enabling effective monitoring and follow-up. Farmers reported increased acceptance of vaccination and adoption of safer livestock-handling practices. This outbreak highlights how CBS, integrated with a One Health framework, can enable timely detection and coordinated response to zoonotic disease threats. Strengthening CBS, risk communication, and cross-sectoral partnerships is essential for enhancing epidemic preparedness in endemic settings.

Keywords: Foot-and-Mouth Disease; One Health; Outbreak Investigation; Bangladesh; Zoonotic Disease; Field Epidemiology; Livestock; Biosecurity

Introduction

Foot and Mouth Disease (FMD) is a highly contagious viral disease of cloven -hoofed animals that causes severe production losses and threatens food security [1]. In Bangladesh, FMD is endemic: an estimated 548,817 cattle and buffalo cases occurred between 2014-2017, and annual economic losses approach US\$125 million [2,3]. In 2020 alone, 25 outbreaks were reported, especially in Rajshahi and neighboring regions [4]. Preventing and controlling FMD thus requires integrated action across human and animal health sectors. The One Health paradigm – an integrated approach optimizing

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the health of people, animals, and ecosystems – stresses cross -sector collaboration for emerging zoonoses [5]. Recognizing these links, Bangladesh has begun strengthening multisectoral surveillance and response. For example, in 2023 the Bangladesh Red Crescent Society (BDRCS) partnered with the Institute of Epidemiology, Disease Control and Research (IEDCR) to implement Community-based Surveillance (CBS) in city corporations including Rajshahi. This program trains community volunteers to report "unusual events" among livestock and people. It collects data from the community level and feeds it into national health systems. Community -based surveillance improves early outbreak detection because it uses local capacity effectively [6,9]. On 10 November 2023, a trained volunteer in Ward 24 of Rajshahi City Corporation noticed multiple cattle with fever, oral lesions, and drooling, which were symptoms consistent with FMD, and promptly alerted a BDRCS Field EPPR officer. This paper documents how that alert triggered a coordinated One Health response. We describe the outbreak verification and confirmation, subsequent risk communication and emergency vaccination efforts, and the role of CBS and cross - sector partnerships in controlling the disease. Our report highlights the first response of an outbreak in One Health approach utilizing the CBS platform in Bangladesh and lessons on intersectoral collaboration and community engagement from the Rajshahi FMD outbreak to inform future epidemic preparedness.

Material and Methods

This outbreak report is based on field records and operational reports of the CBS/PPP program and BDRCS. It describes the sequence of response activities undertaken by BDRCS volunteers, municipal authorities, and veterinary services after FMD was first suspected.

Outbreak Detection and Verification: Community volunteers conducted routine household visits under the CBS program. On 10 November 2023, one volunteer reported unusual cattle illnesses to a BDRCS Field EPPR officer. A joint rapid response team comprising BDRCS, Rajshahi City health officials, and Department of Livestock Services (DLS) veterinarians conducted field assessments. Clinical specimens (vesicular fluid) from affected animals were collected for laboratory testing. FMD infection was confirmed by the Rapid Response laboratory on 12 November 2023 (Bangladesh Livestock Research Institute). Risk Communication and Community Engagement: Immediately following detection, BDRCS volunteers, under guidance from IFRC and municipal health staff, implemented a targeted risk communication campaign. They developed and distributed culturally appropriate messages (posters, leaflets) and conducted interpersonal sessions. Key messages emphasized FMD recognition, safe handling of sick animals, disposal of carcasses, and the benefits of vaccination. The aim was to empower farmers with knowledge and to build trust in official response activities.

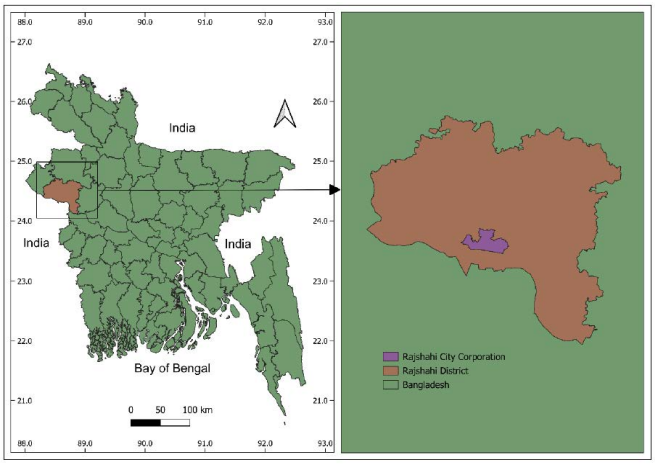

Figure 1: Foot and Mouth Disease (FMD) Outbreak in Rajshahi, Bangladesh -2023.

Emergency Vaccination Campaign: A coordinated vaccination campaign was planned as the main control measure. BDRCS volunteers worked closely with Rajshahi City health and veterinary departments and DLS staff to organize mobile vaccination clinics. In the initial phase (December 2023), teams targeted all 63 cattle in the affected area (excluding 16 pregnant cows for safety) and vaccinated 47 animals. Delays in securing sufficient vaccine doses – exacerbated by local political unrest – postponed the booster phase. Once additional FMD vaccine stocks arrived (February 2025), a second round of vaccination was conducted, ultimately inoculating 170 cattle across 78 farming households. Animals were monitored post -vaccination for adverse reactions and none were reported.

Data Recording: Throughout the response, volunteers and officials -maintained logs of suspected cases, vaccinations administered, and community contacts. Numbers cited here (deaths, vaccinations, etc.) are drawn from these operational records.

Results

The integrated One Health response successfully contained the FMD outbreak with minimal further spread:

Containment of Disease: Early alert by a volunteer triggered timely intervention. No new cluster of cases emerged beyond the initial detection zone, protecting adjacent wards from infection. The rapid response was facilitated by the community surveillance network.

Vaccination Coverage: The two -phase emergency vaccination campaign achieved full coverage of all identified at -risk cattle. In total, 217 animals were vaccinated (47 in phase 1 and 170 in phase). No adverse events occurred, and participating farmers reported high satisfaction with the free vaccination service.

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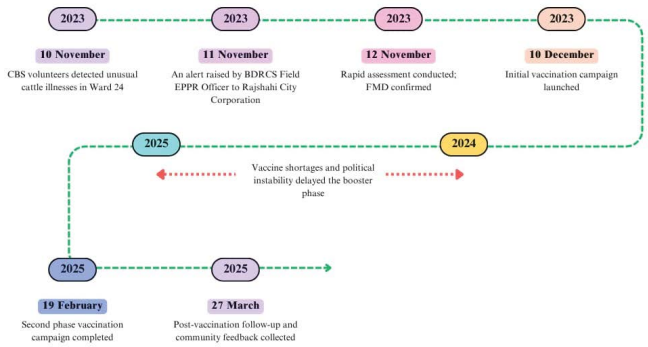

Figure 2: Timeline of FMD outbreak response in Rajshahi, Bangladesh -2023.

Improved Community Practices: Risk communication efforts were associated with greater community acceptance of control measures. After volunteers' educational sessions, farmers showed increased willingness to vaccinate and adopted safer practices (e.g. isolating sick animals, avoiding sale of infected stock). As one report noted, community acceptance of vaccination "increased significantly, and practices that could accelerate disease spread were curbed".

Strengthened Collaboration: The outbreak response reinforced partnerships across sectors. BDRCS volunteers acted as a bridge between livestock -owning communities and government services, enabling faster joint decision-making. The partnership ensured continuous operation despite challenges; for instance, a government veterinarian praised ongoing coordination during vaccine delays.

Discussion

This outbreak underscores the value of One Health and community engagement in zoonotic disease control. The early detection of FMD cases through the CBS platform mirrors findings that community -based surveillance can markedly improve outbreak responsiveness [7-9]. By leveraging trusted volunteer networks, the system provided "eyes and ears" on the ground for zoonoses, consistent with evidence that local participation and ownership are key drivers of surveillance success [7]. Local officials commented that BDRCS's deep community ties and volunteer network filled a critical gap, enabling faster detection and mobilization than typical routine surveillance. The multi-sector response embodied One Health principles: animal and public health authorities worked in tandem, and communication flowed bidirectionally between communities and agencies [5].

WHO and CDC emphasize that emerging threats at the human–animal interface demand precisely this kind of collaborative approach. In line with WHO guidance on risk communication, authorities engaged communities as equal partners in crafting responses. The documented increase in farmers' trust and cooperation illustrates how empowerment through information can lead to behavior change, a core goal of community engagement in outbreaks [10]. Emergency vaccination of livestock is recognized as a cornerstone of FMD control. Vaccines with appropriate antigen strains are among "the best approaches to control and eradicate" FMD. Our deployment of an existing FMD vaccine bank – albeit delayed by supply issues – protected hundreds of animals and likely prevented wider economic losses. This outcome is consistent with FMD control strategies recommending high -coverage vaccination (≥80%) in endemic settings [11-13]. The absence of vaccine -related adverse events and the eventual 100% coverage of target animals attest to the operational success of this intervention. Community trust and ownership were critical throughout. Trust -based relationships (respectful communication, empathy) facilitated acceptance of interventions. This aligns with the literature: high levels of community acceptability, collaboration, and trust are repeatedly identified as enabling factors in CBS systems [14]. In practice, farmers likened the loss of a cow to losing a family member and initially hesitated about vaccination costs. Volunteers' culturally sensitive communication (treating farmers as partners) overcame fears and encouraged participation. Such trust-building is essential for both emergency response and longer -term resilience. Our experience had limitations. Vaccine shortages and political instability slowed response timelines. These contextual hurdles are common in humanitarian settings and underscore the need for contingency planning (e.g. local vaccine reserves, alternative logistic routes). We also encountered unregistered livestock and handling challenges, suggesting that routine animal registry and veterinary capacity could be strengthened.

Conclusions

The Rajshahi FMD outbreak response demonstrates that community -based One Health strategies can effectively contain livestock epidemics. Early warning by volunteers, combined with intersectoral collaboration, emergency vaccination, and proactive communication, protected vulnerable livelihoods. These findings support continued investment in CBS platforms and One Health coordination in Bangladesh and similar settings. Empowering community networks as the first line of defense is not only feasible but essential for epidemic preparedness and public health security.

Conflict of Interests

The authors declare that they have no conflicts of interest.

Authors' contributions

- **Md. Shahonays Rashid:** Conceptualization, Investigation, Methodology, Writing – review & editing
- **Immamul Muntasir:** Conceptualization, Writing – original draft, Formal analysis, Visualization, Writing – review & editing

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- **Md. Omar Qayum:** Methodology, Resources, Validation, Writing – review & editing.
- **Arifa Hasnat Ali:** Data curation, Formal analysis, Visualization, Writing – original draft
- **Nazmus Sakib:** Project administration, Investigation, Data curation, Writing – review & editing
- **Mohammad Rashedul Hassan:** Project administration, Investigation, Data curation, Writing -review & editing
- **Kywa Thowai Prue Prince:** Data acquisition, Investigation, Community engagement, Writing – review & editing
- **Tahmina Shirin:** Supervision, Conceptualization, Writing – original draft, Formal analysis, Visualization, Writing – review & editing

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Ethical Approval Statement

As this is an immediate response to an emergency public health event and not considered research, this investigation was not subject to ethical review board approval. However, verbal consent was obtained from the participants and guardians of the minors before the data and samples were collected. In addition, absolute confidentiality and data security were ensured by using a password -protected device.

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