One Health Outlook

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One Health investigation of the first human rabies death linked to a clinically suspected rabid bull calf in Bangladesh

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Abstract

Rabies is a fatal and neglected zoonotic disease that remains endemic in Bangladesh. Most human cases result from dog bites, and it is not uncommon for livestock to be bitten by dogs. This report presents the first known clinically diagnosed human rabies case in Bangladesh associated with exposure to infected livestock. The case involved a 65-year-old male farmer from rural Bangladesh who died of clinically diagnosed rabies after a minor, unrecognized exposure to a bull calf suspected of having rabies. The man suffered very little hand injuries while feeding the calf, which had been showing progressive neurological symptoms consistent with rabies. Despite medical advice, he did not receive post-exposure prophylaxis (PEP), largely due to negligence. Thirty-four days after the exposure, the man began to exhibit early symptoms of rabies, including limb weakness, neck and back pain, anxiety, and early signs of hydrophobia. The illness quickly progressed to the classic features of furious rabies, such as severe hydrophobia, aerophobia, confusion, and agitation. He died 41 days after the initial exposure. This case triggered fear and panic in the local community, reflecting a broader lack of awareness about rabies, particularly its transmission from non-traditional hosts like livestock. The incident highlights the severe consequences of inadequate awareness and delayed or missed PEP following potential rabies exposure. It emphasizes the urgent need to raise public awareness about all possible transmission routes, ensure timely access to PEP for both humans and animals, stray dog vaccination and strengthen public-veterinary health collaboration in Bangladesh.

Introduction

Rabies is a highly fatal yet entirely preventable disease. It remains neglected in poor resource settings [1]. Delays or failures in administering post-exposure prophylaxis (PEP) increased the risk of life loss [2, 3]. In Bangladesh, rabies remains a major public health issue, with most human cases linked to bites from rabid dogs and occasionally other carnivores [4]. Bangladesh has made significant progress in reducing human cases through mass dog vaccination and PEP [5]. Livestock deaths due to rabies is not uncommon in Bangladesh. Between 2010 and 2012, 3,425 rabies deaths (cattle: 2845; goats: 547; sheep: 13) were reported in livestock [6]. Many endemic

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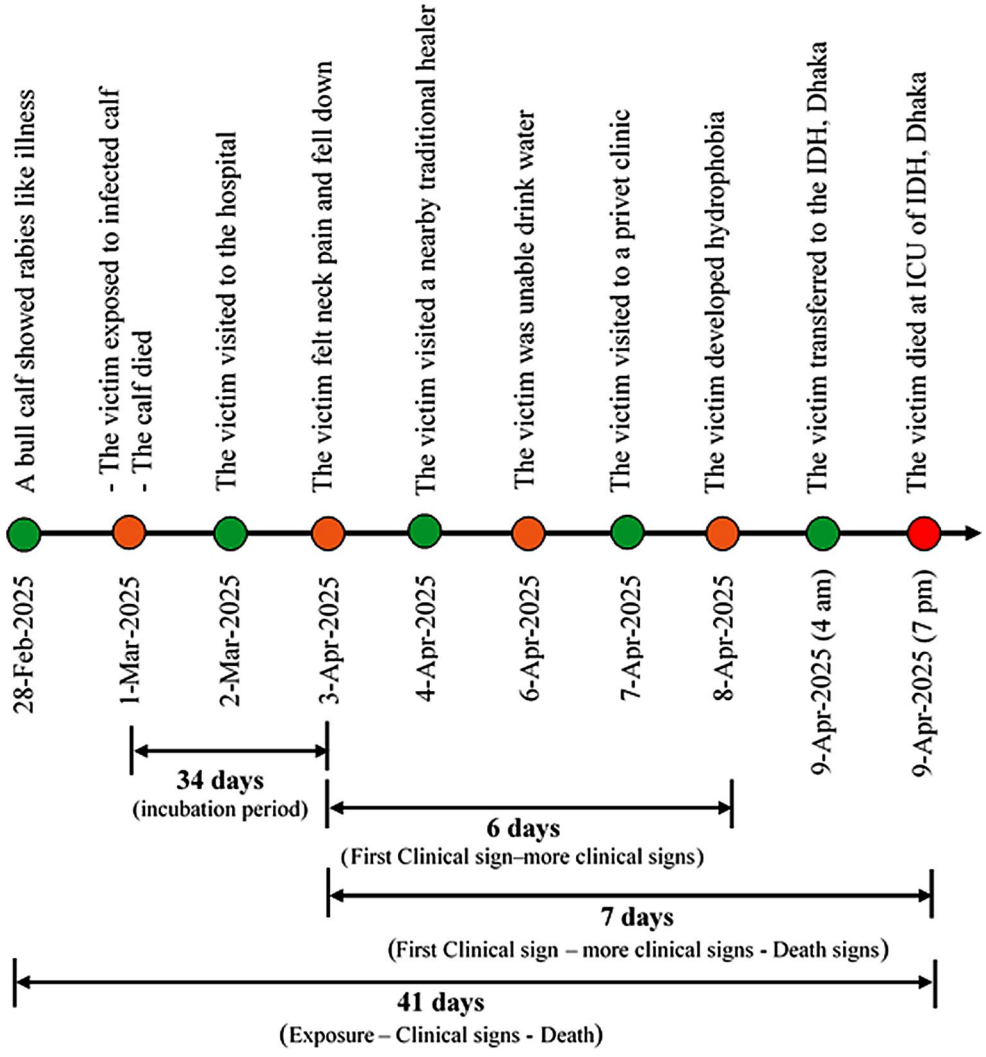

Fig. 1 Time line of key events for the case study

countries have reported rabies in livestock but livestock bite associated human cases were rarely reported [7–9]. This report describes the clinically identified first fatal human case with a clear history of exposure to a clinically suspected fatal rabid bull calf in Bangladesh.

Case presentation

On April 19, 2025, a male patient over the age of 65 presenting with classic rabies symptoms, including hydrophobia and excessive salivation, was admitted to the Infectious Diseases Hospital (IDH) in Dhaka at 7:44 AM. As the central referral hospital for rabies cases in Bangladesh, IDH Dhaka promptly conducted a clinical assessment, and expert physicians diagnosed the patient with rabies. Despite receiving medical attention, the patient passed away later that day at 6:45 PM (Fig. 1). According to a report provided by the patient's son, the individual had been exposed to a rabid bull-calf 41 days prior.

To better understand the case and associated exposure, a One Health investigation team including a veterinary epidemiologist, medical epidemiologist, and an anthropologist visited the patient household on 1st May 2025. A systematic qualitative investigation was conducted. We invited all people who observed the victim from prior animal's exposure to death. Four people took part in a two-hour interview session. Verbal consent was obtained from the patient prior to the interview, including permission for audio recording and publication of the case data in the journal. The recording was later transcribed into English by the anthropologist. Participants included two sons of the victim and two neighbors.

On February 28, a four-month-old bull calf belonging to the victim's neighbor suddenly began showing signs of excessive salivation. The following day, a local, unqualified animal healer (quack) was called to examine the calf. Upon observation, the calf was unable to drink water and continued to salivate profusely. After examining the

animal, the healer administered a drug via intramuscular injection. Noting the calf's inability to drink milk on its own, he advised the owner to collect milk from a milking cow and feed it to the calf using a bottle.

At that time, the calf's owner, along with his friend (the victim), attempted to feed the calf using the bottle. During the process, the victim used his hands to open the calf's mouth while the owner administered the milk. In doing so, the victim sustained a minor scratch approximately one inch in length on his right hand. The wound showed slight fluid oozing, but no active bleeding was reported. However, neither the victim nor his friend informed anyone about the injury at the time. The calf consumed a small amount of milk but also spilled some, along with saliva, which was wiped off with an old cloth. The local healer then contacted a registered veterinarian for further advice on the treatment of the affected calf. Approximately 35 min later, the veterinarian arrived. Shortly after his arrival, the calf let out a loud cry, suddenly collapsed, and died at 9:00 AM, exhibiting signs of respiratory distress and convulsions. Based on his clinical assessment, the veterinarian informed the owner that rabies could be a likely cause of death, despite the absence of any known history of a dog bite. When asked about potential exposure to dogs, the calf's owner stated that

> *The affected calf had been living around several dogs and five of those dogs are still around and not sick. None of the five dogs have died to date, which leads me to believe they might not be infected. We never actually witnessed the calf being bitten. The calf spent most of its time with these dogs, often lying and playing together on the same rice straw. This straw might be contaminated with the dogs' saliva, providing a possible route of exposure through ingestion of saliva.*

The calf owner and the victim jointly dug a hole and buried the deceased calf at 10:00 AM. During the burial, the victim informed the calf owner that he had a minor scratch on his finger while feeding milk to the calf. Although the wound did not bleed visibly, there was slight fluid oozing. The calf owner reported this to the attending veterinarian, who warned that there was a potential risk of rabies transmission. He advised the victim to seek immediate medical attention at the nearest public hospital. The following day, the victim and the calf owner visited the Upazila Health Complex. The on-duty physician examined the wound and noted that it was extremely minor and barely visible. When asked about bleeding, the victim responded that there had been none—only slight moisture. The doctor prescribed oral medication costing approximately USD 60 and recommended that the victim receive a rabies vaccination, emphasizing that the risk could not be ruled out despite the absence of a dog bite. However, the victim did not take the recommendation seriously. Hospital staff cleaned the scratch with a Chlorhexidine Gluconate-Cetrimide solution and provided some medication. At that time, the calf owner recalled a childhood incident in which someone had died from a similar exposure and became increasingly concerned. He repeatedly urged the victim to get vaccinated, stressing that the rabies vaccine was freely available and potentially life-saving. He added - the victim never disobeyed me before, but this time, he didn't listen. Despite repeated warnings, the victim remained unconvinced, believing that the prescribed medication was sufficient, and ultimately refused to receive the vaccination. The calf owner said that

> *It was Saturday (1st March 2025), the day before the holy month of Ramadan was about to begin, one month and twenty days after that incident, the symptoms suddenly appeared. The scratch was minor, but I did notice that it remained slightly moist-oozing. We didn't suspect anything harmful or alarming. I still remember, I took the victim to the main hospital just a day after the scratch happened. The doctor said the treatment wouldn't cost anything, just he needs to receive the Anti-rabies vaccine (PEP). But unfortunately, I couldn't convince the victim to take it. That's the greatest sorrow I carry in my heart.*

On April 3, 2025, the victim went to the field to cut grass for their livestock. While returning, he experienced neck pain for the first time since the calf exposure and later collapsed at the edge of the field. He managed to stand up on his own and return home. The victim shared his health concern with his friend—the owner of the deceased calf. The calf owner applied some pain-relief ointment to the victim's neck, and he felt slightly better. However, over the next two days, unusual symptoms began to emerge. The following day, the victim complained that the pain had worsened, though he had no fever or other major signs of illness. Notably, he even refused to smoke a cigarette, which he occasionally did. He asked the calf owner what could be done about the neck pain. The calf owner responded that they would visit a doctor later that afternoon. That afternoon, they visited a nearby traditional healer (quack), a friend of the victim, who prescribed two painkillers and some gas tablets (a gastroprotective agent) and advised a hot bath - possibly referring to hot compresses on the neck. They returned home, ate, the victim took the medications, and they drank tea together while watching television news. However, the victim complained that the pain was not

improving. Around 7:30 PM, they went to the mosque for evening prayers, and the victim returned home by bicycle. At 8:00 PM, they met again to chat and chew betel leaves, but the victim said he was not feeling well. He mentioned he would consult a more qualified doctor. He also reiterated his belief that the neck pain might have been caused by pressure during his earlier fall. Due to increasing severity of symptoms, the victim later went alone to a local pharmacy and returned home with some additional medicines. Two days later, he could no longer drink water. That marked the turning point. He was able to eat a small amount of dry food but could not consume any liquids. When the calf owner offered him a piece of watermelon, the victim refused, stating he had difficulty ingesting anything with liquid. He managed to eat a little cake but continued to avoid water or any other liquid. On the morning of April 7, 2025, the victim was taken to a private clinic for treatment. The attending physician conducted a physical examination and recommended several diagnostic tests, including an MRI of the spine. The MRI report did not reveal any significant abnormalities. The doctor noted a knee injury from the earlier fall and prescribed medication. The family inquired whether hospital admission was necessary, but the doctor advised that it was not. Because no one in the family was aware of the calf-related scratch, they did not inform the doctor about it. The wound, which was over a month old and already dry, remained undisclosed. After the consultation, the family returned home.

On the morning of April 8, 2025, the victim became restless and refused water, bathing, or going near water, covering his face with a towel. Alarmed by these behaviors, his younger son and daughter-in-law grew concerned, suspecting rabies. They asked if he had been bitten or scratched by an animal, and after repeated questioning, the victim eventually disclosed that

> *Yes, I was injured while we were trying to drink milk to the bull calf. Perhaps out of frustration, the victim said angrily, "I took the medicine for treatment, the quack said it is not a problem now.*

Recognizing the seriousness of the situation, the victim's elder son consulted physicians at a private clinic and shared the history of potential animal exposure. The physicians advised immediate transfer to a tertiary care hospital or the Infectious Diseases Hospital (IDH) in Dhaka, as their clinic lacked the necessary facilities to manage suspected rabies cases. In the early hours of April 9, around 4:00 AM, the victim and his family departed for IDH using a locally hired private car. The distance from their home to the hospital was approximately 100 km, and they arrived at IDH by 6:00 AM. By that time, the victim's condition had worsened—he was exhibiting excessive salivation, signs of delirium, visible anxiety and agitation, and a continued refusal to drink water. Despite his declining physical state, he remained mentally alert, recognized his family members, and communicated with them, expressing his belief that he was going to die soon. While waiting for the attending physician, the family noted that the victim showed no signs of confusion or overt delirium. At 8:00 AM, upon the physician's arrival, the victim was admitted to the hospital's dedicated 'Rabies Care Corner'. An initial clinical assessment revealed tachycardia, restlessness, and fluctuating levels of consciousness. A full neurological examination was limited due to his agitation, but no focal deficits were observed. The patient had no history of mental illness, substance use, or previous similar episodes.

Given the clinical presentation and epidemiological history, a provisional diagnosis of suspected rabies encephalitis was made. No laboratory test was performed to confirm the diagnosis due to resource limitations. At 11:00 AM, the victim was transferred to the Intensive Care Unit (ICU), where his condition continued to deteriorate. Nonetheless, he remained conscious and coherent, speaking with family members, offering blessings and forgiveness. He explicitly named the calf's owner involved in the exposure incident, emphasizing that the blame lay with himself - not the calf's owner. At 7:00 PM, the victim passed away in the ICU.

Community reaction about the event

Following the victim's death, fear quickly spread throughout the local community. Anxiety intensified due to the absence of a confirmed diagnosis prior to the patient's transfer to the Infectious Diseases Hospital (IDH) in Dhaka. Many residents feared that the illness was more contagious and dangerous than the recent pandemic. Some believed they could become infected simply by visiting the victim's home or by coming into contact with those who had cared for him. Driven by this fear, neighbors discouraged the traditional ritual of bathing the deceased, believing it might facilitate disease transmission. Instead, they urged an immediate burial without customary funeral practices. Ultimately, the victim's son assumed the responsibility of bathing the body, assisted only by a religious scholar from a neighboring town, as no one from the local community was willing to help. The burial, which is typically a communal event involving collective prayers and support, was conducted in isolation, with neighbors keeping their distance. In the days that followed, the victim's family faced ongoing social stigma. Several local shops refused to sell them goods out of fear of contagion. In response, officials from the Department of Livestock Services (DLS) organized a community awareness meeting to educate residents about rabies and to emphasize the importance of timely vaccination

following potential exposures. As a precautionary measure, livestock officials recommended post-exposure prophylaxis (PEP) for all family members and anyone who had been in close contact with the victim. A total of eight individuals, including relatives and caregivers, received the rabies vaccine. In addition, the remaining cattle from the victim's household, including those that had been in contact with the suspected rabid calf, were also vaccinated. However, no dogs in the affected community were vaccinated.

Discussion

Rabies is a 100% fatal but entirely preventable zoonotic disease and remains a significant public health concern in Bangladesh, where canine rabies is endemic. However, rabies transmission from livestock, particularly cattle is rarely reported as a source of human infection. This case represents the first clinically documented human rabies death in Bangladesh linked to a rabid bull calf, highlighting an unusual but critical transmission route that warrants serious attention. The incident underscores the tragic consequences of missing timely post-exposure prophylaxis (PEP) following a minor yet suspicious exposure to a potentially rabid animal. A 65-year-old farmer from a rural community in Bangladesh was exposed while handling a bull calf that exhibited aggressive behavior and excessive salivation - classic clinical signs of rabies. The absence of visible bleeding and the indirect nature of the exposure led to a false sense of security for the patient, his friend, and his family. Although it was suspected that the calf may have been exposed to a rabid dog, this could not be confirmed. Importantly, rabies can be transmitted through contact between infectious saliva and broken skin - even through superficial scratches. This case reinforces the need for heightened awareness and vigilance following any potential exposure to animals displaying neurological symptoms. Rabies infection in cattle, buffalo, sheep, and goats is not uncommon, and to date, no human cases have been documented as a result of bites from rabid livestock [10]. However, there remains a potential risk of human rabies transmission through close contact, such as during feeding or administering medication to infected animals. A similar case was reported in Iran, involving a 39-year-old male veterinary technician who developed rabies after inserting his unprotected hand into the mouth of a rabid bovine and sustaining a scratch. The individual later developed encephalitic rabies and died shortly after the onset of symptoms. This case underscores critical gaps in rabies prevention and control, particularly following non-bite exposures involving livestock [11]. A recent case in Pakistan involved a farmer who was exposed to rabies following a bite from a cow that was likely infected after being bitten by a rabid dog [7]. While canine-mediated rabies remains the primary global health concern, spillover events to livestock and subsequent human exposures represent underreported and often overlooked threats [12]. These case reports underscore the critical importance of administering post-exposure prophylaxis (PEP) following any animal bite or exposure that carries even a minimal risk of rabies transmission.

The lack of PEP or delayed PEP or incomplete PEP may influence the occurrence of rabies. This case report emphasized the lack of public awareness about PEP, vaccine hesitancy and social stigma around animal-related injuries. The death of a farmer following exposure to a clinically suspected rabid bull-calf has brought to light critical weaknesses in rabies control program of Bangladesh. As the first documented case involving suspected transmission from livestock, it signals an urgent need to expand the current dog-centric rabies control framework to include other potential sources particularly livestock. The role of livestock in human rabies transmission is often overlooked. Clinical diagnosis of rabies in livestock is challenging because infected animals typically present with either the furious or paralytic (dumb) form. The paralytic form often goes unnoticed unless there is known exposure to carnivores exhibiting signs such as hypersalivation. Integrating molecular testing tools into rabies control programs could play a crucial role in confirming cases and improving surveillance [13]. To address current diagnostic gaps, nationwide mandatory reporting and testing of suspected rabies cases should be implemented. Establishing One Health Rapid Response Teams (OH-RRTs) in high-risk areas would facilitate prompt investigations, timely sample collection, and laboratory confirmation. These measures are crucial for improving early detection, guiding public health interventions, and preventing future fatalities. In parallel, targeted awareness campaigns are needed to combat social stigma, dispel misinformation, and correct misconceptions surrounding animal bite management-particularly the reliance on homeopathic or traditional non-pharmaceutical remedies. Such efforts are essential to reducing the incidence of human rabies. Additionally, routine saliva testing of asymptomatic dogs in high-risk areas may help identify undetected viral shedding.

Conclusions

While dog-mediated rabies remains the predominant concern, this case highlights that rabies in livestock also poses a serious yet often overlooked threat to human health. Strengthening community knowledge through education on rabies transmission and the critical role of post-exposure prophylaxis (PEP) is essential. Enhancing laboratory capacity is essential for the accurate diagnosis of rabies in both animals and humans. This case also

underscores the urgent need for routine vaccination of all stray dogs, especially in high-risk areas.

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Author contributions
S.C. and S. U participated in conceptualization and methodology. S.C, S.K.B, S.P, S.M.G.K, M. G.A.S.G, F.T, S.C.B, F.H, A.B and S.U worked on data collection and analysis. S.C prepared the manuscripts. S.U contributed to the supervision of methodology, data analysis, and manuscript edition. S.K.B, S.P, S.M.G.K, M. G.A.S.G, F.T, S.C.B, F.H, A.B and S.U participated in manuscript edition.

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Data availability
The data from this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
This case report was prepared based on outbreak investigation. Informed verbal consent obtained from the deceased's elder son.

Consent for publication
Verbal informed consent was obtained from the deceased's elder son for publication of this case report.

Competing interests
The authors declare no competing interests.

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