Crimean-Congo Hemorrhagic Fever Outbreak in Omaheke Region, Namibia, 2017: An Outbreak Investigation

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Abstract

In March 2017, Gobabis district reported a suspected case of Crimean Congo Hemorrhagic Fever. The patient who had a history of tick bite presented with bloody vomitus, bloody stools, and Jaundice. We investigated the outbreak to determine its magnitude, and institute control measures. We conducted a descriptive, cross-sectional study to investigate the outbreak. We conducted active case search in health facilities, followed up contacts, and raised community awareness by providing health education. Data was analyzed by calculating frequencies and proportions by person, place, and time. Two confirmed cases were reported for this outbreak with a case fatality of 50%. All cases were males who were involved in livestock rearing. A total of 64 contacts were identified and followed up for 15 days. Contacts who developed signs and symptoms of Crimean Congo Hemorrhagic Fever were tested but none tested positive for the disease. The majority of contacts were family members who lived and provided care to the cases and healthcare workers who attended to the cases in the hospital setting. Environmental assessment among affected farms was done and the application of acaricides on animals was conducted by veterinary services. This outbreak was associated with tick bite. The findings highlight the occupational risk of Crimean Congo Hemorrhagic Fever among livestock handlers and the vulnerability of healthcare workers when infection prevention and control measures are not consistently applied. Strengthening surveillance systems, improving healthcare worker training on infection prevention and control, and promoting community awareness on tick bite prevention are vital to prevent future outbreaks. The successful intersectoral collaboration demonstrates the importance of integrating a One Health approach to prevent future epidemics.

Keywords: CCHF, Congo Fever, Hemorrhagic fever, Namibia, Outbreak

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1. Introduction

Crimean Congo Hemorrhagic Fever (CCHF) is a zoonotic viral disease caused by the Nairovirus of the Bunyaviridae family (CDC, 2024; WHO, 2022). It was first identified in the Crimean Peninsula in the 1940s and was initially named Crimean Hemorrhagic Fever (CDC, n.d.; Yilmaz et al., 2009). In 1969, a similar illness was reported in the Congo, leading to the current name,

Crimean Congo Hemorrhagic Fever (CDC, 2024; Pakistan National Institute of Health Islamabad, 2005). CCHF is currently endemic in several regions including Africa, the Balkans, the Middle East, and Asia, particularly in countries located south of the 50th parallel north (WHO, 2022). The disease has caused multiple outbreaks with reported case fatality rates ranging from 10% to 40%, although higher fatality rates have been documented in smaller outbreaks (WHO, 2022).

Ixodid ticks, particularly those of the *Hyalomma* genus, serve as both the reservoir and vector of the virus. A variety of domestic animals such as cattle, goats, and sheep act as hosts for the virus without showing clinical illness (CDC, 2024). Human infection typically occurs through tick bites or through direct contact with infected animal blood or tissues (Vanhomwegen et al., 2012; Yilmaz et al., 2009). Human-to-human transmission may also occur through exposure to infected blood, secretions, organs, or other bodily fluids, particularly in healthcare settings. The incubation period varies depending on the mode of transmission and viral load. Following a tick bite, symptoms usually develop within 1–3 days, with a maximum incubation period of nine days. When infection occurs through exposure to infected blood or tissues, the incubation period is typically 5–6 days and may extend to 13 days (NICD South Africa, 2017; Vanhomwegen et al., 2012; WHO, 2022). The disease usually begins with sudden onset of fever, headache, myalgia, and gastrointestinal symptoms. Severe cases may progress to haemorrhagic manifestations. Diagnosis is confirmed through laboratory tests such as ELISA, RT-PCR, antigen detection, and viral isolation. Currently, treatment is mainly supportive, although Ribavirin has been suggested as a potential antiviral therapy in some cases (Athar et al., 2003; CDC, 2016; Mardani et al., 2003; NICD South Africa, 2017). There is no widely available vaccine for CCHF. Prevention primarily relies on reducing exposure to ticks and infected animal tissues. Health education and community sensitization are especially important for high-risk groups such as livestock herders, farm workers, abattoir workers, and healthcare workers in endemic areas (CDC, 2024). Preventive measures include the use of personal protective equipment (PPE) when handling suspected cases or biological samples, as well as tick control measures such as the use of repellents and acaricides on animals (WHO, 2022).

In February 2017, the Gobabis district in the Omaheke Region reported suspected cases of CCHF. On 18 February 2017, a 20-year-old male farm worker from Farm Humpata presented to Gobabis State Hospital with flu-like symptoms. The symptoms began on 16 February following a tick bite while assisting with the delivery of a cow. He was treated as an outpatient and discharged. On 20 February, he returned to the hospital with bloody vomitus, bloody stools, and jaundice. Healthcare workers suspected CCHF, and he was admitted in isolation while laboratory samples were collected. The patient died on 22 February before laboratory confirmation. On 23 February, the results returned PCR positive for CCHF.

Following confirmation of the case, the emergency outbreak committee was activated using a One Health approach involving collaboration between the Ministry of Health and Social Services (MoHSS) and the Ministry of Agriculture, Water and Forestry (MAWF). Since CCHF is considered an epidemic-prone disease, a single confirmed case constitutes an outbreak according to national surveillance guidelines (MoHSS, 2011). The outbreak was officially declared on 24 February 2017. The objectives of this investigation were to describe the outbreak in terms of person, place, and time, determine the source and magnitude of the outbreak, and institute appropriate control measures.

2. Materials and Methods

2.1 Study design

A descriptive, cross-sectional study was conducted to investigate this outbreak.

2.2 Study setting

Omaheke is situated in the South Eastern part of Namibia. It is bordering Botswana on the east, Otjozondjupa region on the north, Khomas region on the west and Hardap region on the south. It is a vast and sandy region where people survive mostly on farming. It is a one region, one health district with a 73396 catchment population. The investigation was conducted at Gobabis district hospital, Farm Humpata, Epako location, Okongoua village, and Post 13 Corridor clinic.

2.3 Sampling and data collection

Affected health facilities were visited. We performed an active case search for suspected/ missed cases by reviewing medical records including the out and in-patient registers.

2.4 Case definitions

- **Suspected CCHF case**: Illness with sudden fever, malaise, weakness, irritability, headache, severe pain in limb sand loins, and marked anorexia. Early development of flush on face and chest and conjunctival infection, haemorrhagic anathema of the soft palate, uvula, and pharynx, and often fine petechial rash spreading from the chest and abdomen to the rest of the body, sometimes with large purpuric areas.
- **Laboratory confirmed CCHF case**: A suspected case with laboratory (positive IgM antibody, PCR, viral isolation, or IgG seroconversion by ELISA or IFA)
- **Epidemiologically linked cases:** A case with signs and symptoms of CCHF and who is connected or linked to the laboratory-confirmed case or outbreak.

2.5 Outbreak coordination, response, and control using a one-health approach

The following teams were identified: contact tracing; communication, social mobilization; and Infection Prevention and Control (IPC). We used the standard case investigation tools (case investigation forms, line lists, and contact tracing forms) as stipulated in the Integrated Disease Surveillance and Response (IDSR) guideline.

- MoHSS was the overall outbreak coordinator. They provided treatments and performed active case search in the communities where confirmed cases reside and identified the contacts according to their level of risk exposure. They conducted continuous observation and follow-up of contacts. The IPC team also conducted safe burials of patients.
- MAWF visited affected communities to make assessments on the animal movements, and tick infestation and to identify a feasible tick control measure. They collected blood samples from animals in the affected farms and villages. They also provided acaricides and performed animal dipping and acaricide application against ticks.
- Namibia Institute of Pathology (NIP), National Institute of Communicable Diseases (NICD), and the Central Veterinary Laboratory tested the human and animal samples respectively.
- Otjiherero Radio was used for community sensitization to give health education
- The social mobilization team comprising MoHSS and MAWF staff conducted community sensitization in the communities and gave health education through mass media in various local languages. The education touched on the basics of CCHF, signs & symptoms, transmission, and prevention measures. This was intended to promote early detection of cases and to implement infection control at household level.

2.6 Reliability and Validity

Reliability and validity of the findings were supported through the use of standardized outbreak investigation procedures and clearly defined processes throughout the study. Case identification and classification were guided by standard case definitions outlined in the IDSR guideline, ensuring consistency in identifying suspected, confirmed, and epidemiologically linked cases.

Data collection followed standardized tools including case investigation forms, line lists, and contact tracing forms used routinely by the MoHSS during outbreak investigations. The use of these standardized instruments ensured that data were collected systematically across all study sites. In addition, laboratory confirmation of cases was conducted using RT-PCR testing by accredited reference laboratory (NIP), which strengthened diagnostic validity. Contact tracing procedures followed IDSR protocols, including daily monitoring of identified contacts for 15 days after the last exposure. Environmental assessments and vector control activities were conducted in collaboration with veterinary services using established tick control measures. These standardized methods and clearly defined procedures at each stage of the investigation enhanced the reliability, consistency, and validity of the study findings.

3. Results

Eight cases were identified from 18th Feb to 31th March 2017 in Gobabis District of the Omaheke region, Namibia. Out of those, two were laboratory confirmed while six tested negative. Amongst the identified cases, seven were males whilst only one was female. Of the two confirmed cases, one death was reported hence the Case Fatality Rate (CFR) was 50%.

The index case was a 20 years old male, farm worker from Farm Humpata. He reported to Gobabis State Hospital outpatient department on the 18th February 2017 with complaints of headache and flu-like symptoms. The date of onset of symptoms was 16 February 2017. He was treated and went back home. He returned to the on the 20th February 2017 presenting with bloody vomitus, bloody stools, and jaundice. He also revealed that a tick had bitten him on the 15th February 2017 whilst assisting with a cow delivery. He was admitted and isolated. He died on the 22nd February 2017. On the 23rd February, his blood specimen tested RT PCR positive for CCHF. No secondary case was diagnosed among family members or HCWs.

The second confirmed case, was a 19 years old male who resided at Okongoua Village in the Aminius Constituency. He got bitten by a tick on the 01st March 2017. He presented at Post 13 Corridor clinic on 05th March 2017 with fever (Temp 38.5°C), headache, diarrhea, and vomiting. He was admitted and transferred to Gobabis State Hospital for continuous monitoring and management. On the 06th March 2017, he was transferred to Windhoek Central Hospital on clinical suspicion of fever and having bled twice (epistaxis and bloody vomitus). His preliminary blood results indicated severe thrombocytopenia, and deranged liver enzymes and clotting profile. On the 9th March 2017, his CCHF results returned PCR positive. He was discharged on the 22nd March 2017 in a stable condition.

Sixty-four contacts were identified for the two confirmed cases and followed up for 15 days from the last day of contact with the confirmed case. The following tables describe the characteristics of contacts.

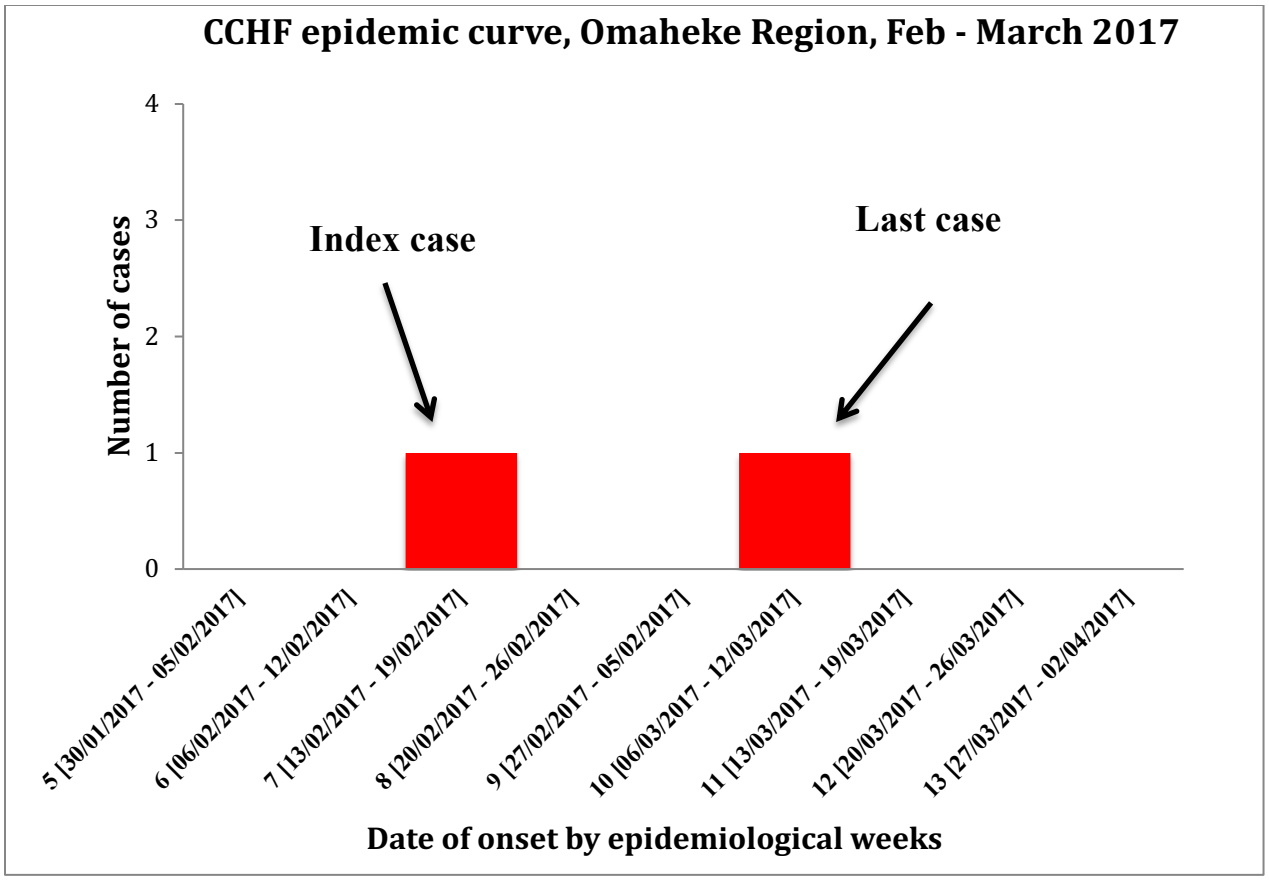

Figure 1: The epidemic curve of the CCHF outbreak, Omaheke Region, Namibia, Feb - March 2017

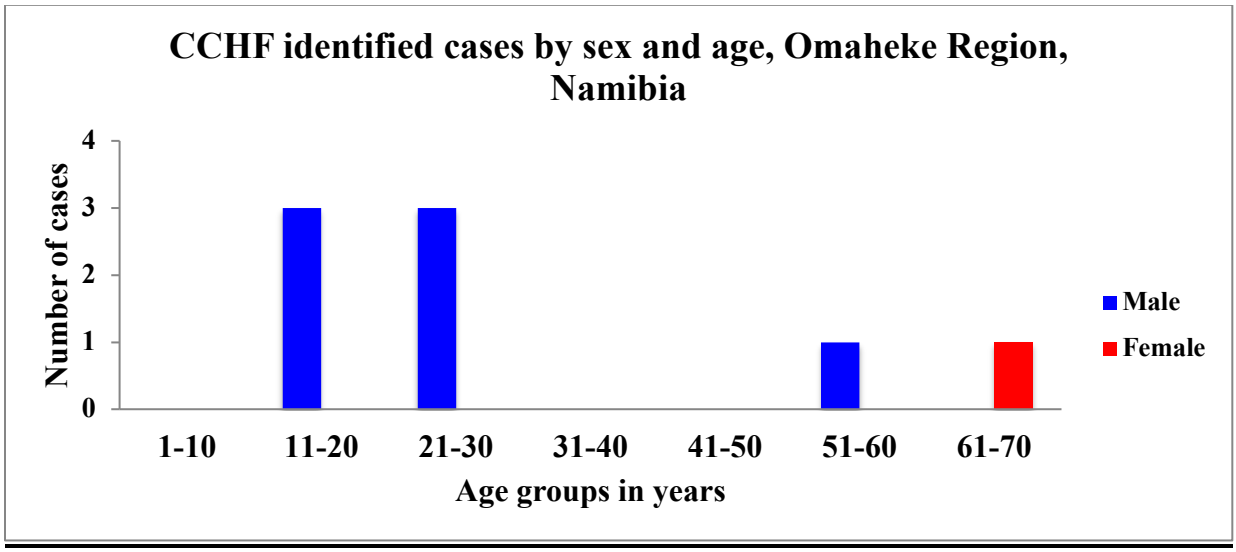

Figure 2: Distribution of CCHF identified cases (negative and positive) by age and sex, Omaheke Region, Namibia, Feb- March 2017

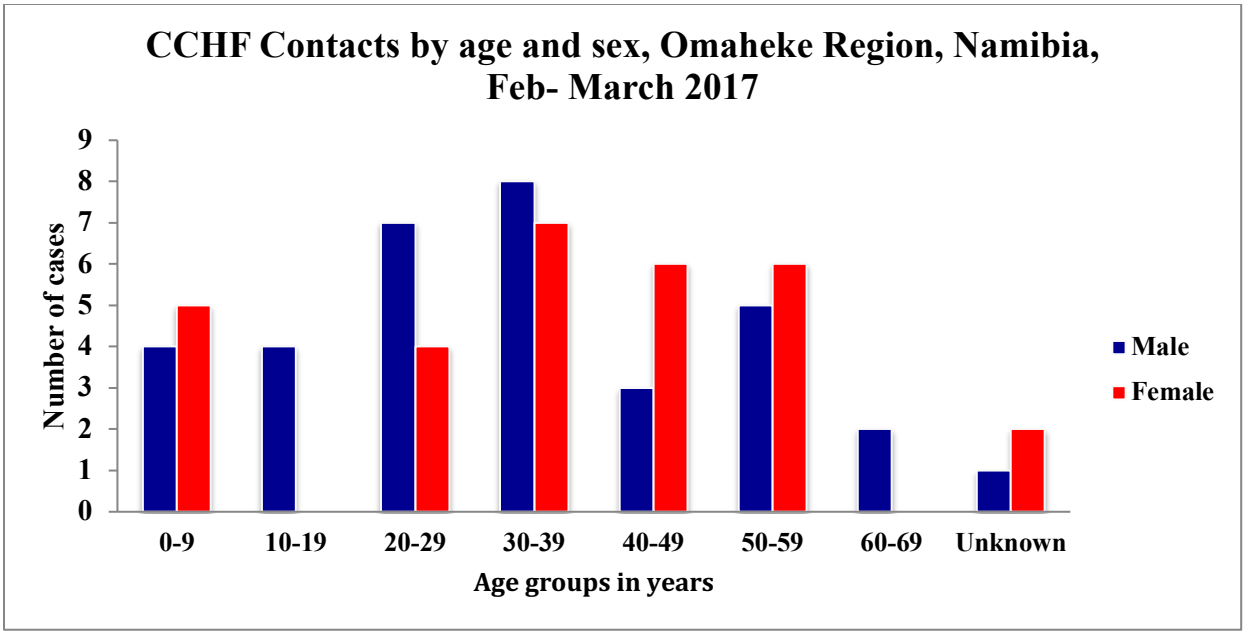

Figure 3: CCHF contacts by age and sex, Omaheke Region, Namibia, Feb- March 2017

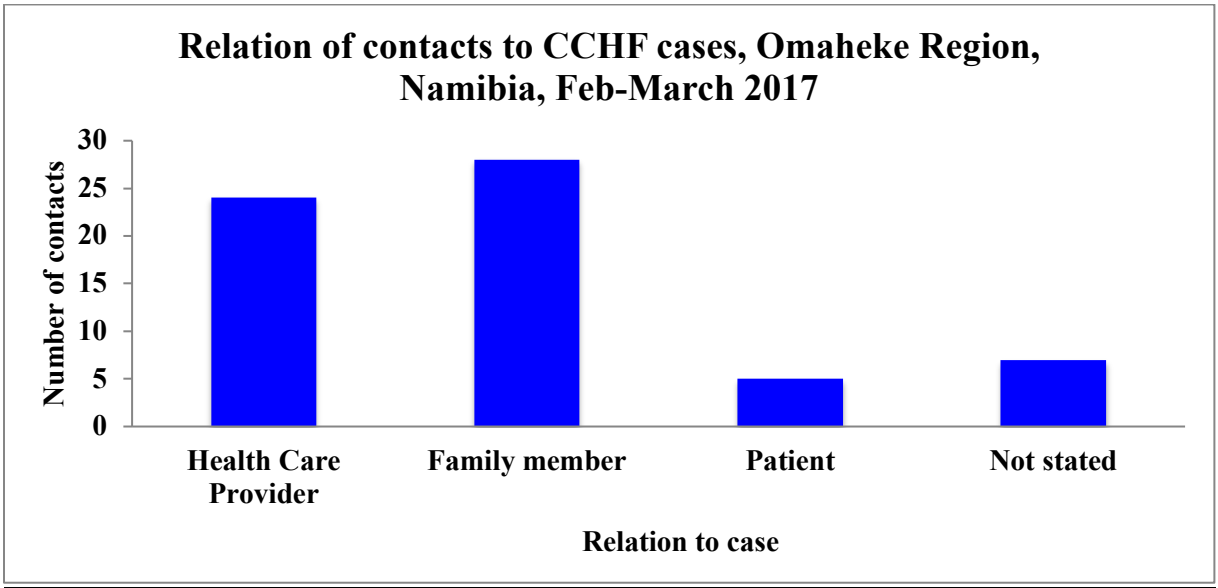

Figure 4: Relation of contacts to CCHF cases, Omaheke Region, Namibia, Feb-March 2017

4. Discussion

Crimean Congo Hemorrhagic Fever is a notable public health threat among various communities in Africa. This study provides a description of the CCHF outbreak in Omaheke region in 2017. It is well documented that people working with livestock, animal herds, and raw animal tissues have a higher risk of exposure to CCHF than others(Bente et al., 2013; Salehi-Vaziri et al., 2017). This outbreak had two confirmed cases, of whom all were persons dealing with livestock. The index case was a farm worker and the second case was a son to a subsistence farmer who therefore was involved in caring for the livestock. Our outbreak is in line with our outbreak, a study in Uganda found that people who live near grazing fields or in close proximity to livestock have an increased

risk of contracting CCHF(Mirembe et al., 2021). Living close to livestock increases exposure to tick bites, animal products and tissues, and other related risk factors. The index case did not only have a history of tick bite but also exposure to blood while helping a cow to deliver. All two are potential sources of infection. Nonetheless, the length of his incubation period (1 day) suggests tick bite as the source of infection. History of infection via direct blood contact has been reported in several parts of the world. In some outbreaks, cases had a history of exposure to raw meat(Fazlalipour et al., 2016; Metanat et al., 2018; Ziapour et al., 2016).
Albeit the 2nd case is not a farmer; his father is a subsistence farmer hence the increased level of exposure. He too had a history of tick bite. Onset of symptoms was 2 days after tick bite. He was admitted on the 4th and referred on the 6th due to bleeding, thrombocytopenia, and deranged liver enzymes. This case was discharged on the 22nd March in a stable condition. One could argue that better preparedness as the outbreak progresses could be attributed to the survival of subsequent cases. It is undeniable that health systems are enhanced during outbreak situations, particularly in terms of resources, capacity, and expertise. This generally leads to early detection of cases and prompt, effective management which subsequently improves the chances of survival.

The identified contacts in this outbreak were mostly family members who visited and took care of the cases at home before hospital admission, HCWs who provided care before barrier nursing was commenced, and other patients who were attended to, at the same time as cases and or came in contact with the cases. Similar to our outbreak, other outbreaks have pointed out family members and HCWs as frequent contacts in CCHF outbreaks(Guven et al., 2017; Kizito et al., 2020; Mourya et al., 2019). The exposure of HCWs in healthcare settings raises questions about the availability and use of Personal Protective Equipment (PPE) and exercising IPC standard precautions when attending to patients. In a study by Guven et al (2017), HCWs were exposed due to risky behavior such as performing CPR and not complying with barrier precautions. This was similar to our investigation. While it raises questions surrounding accessibility, it could also be an indicator of ignorance or lack of knowledge. In some outbreaks, HCWs expressed a lack of knowledge on the use of IPC particularly the donning and doffing(Alhumaid et al., 2021; Raab et al., 2020; Thazha et al., 2022). In addition, some also indicated that they have not been trained in IPC(Shaver et al., 2022). A multi-disciplinary approach was implemented to combat this outbreak. MAWF, veterinary division inspected the fences and animal movement for the index case. Since the second is from a communal area, it was much more difficult to control animal movement. Animals were inspected for tick infestation at farms Humpata, Makam, and Veronica. Tick infestation in the inspected areas might be exacerbated by the absence of a tick control program.

The use of multisectoral collaboration in this outbreak was a success as the response was seamless with clear terms of reference and duties. This comes as no surprise as the WHO has termed One Health Approach (OHA) as the most effective way to combat public health threats(Danasekaran, 2024). Collaboration among sectors led to ease of operation as tasks were delegated in consideration of expertise. This not only avoided the duplication of tasks, miscommunications, and fair distribution of resources but it also led to timely, efficient response, subsequently averting more cases.

5 Limitations

Several limitations were noted during the investigation:

- There was limited availability of IPC materials in some health facilities within the region, which may have contributed to healthcare workers' exposure and may also reflect broader resource constraints during the outbreak response.
- Some healthcare workers had limited training or experience in the correct use of PPE, which may have affected adherence to IPC practices.
- Available IEC materials were not translated into indigenous languages commonly spoken by the affected communities, which may have reduced the effectiveness of risk communication and community awareness activities
- Some information used in the investigation relied on patient records and interviews with cases and contacts. These data sources may be subject to incomplete documentation or recall bias, particularly regarding exposure histories such as tick bites or contact with livestock and animal products.
- The relatively small number of confirmed cases limited the ability to conduct more detailed epidemiological analyses
- Diagnostic confirmation depended on laboratory testing performed at reference laboratories, which may have resulted in delays in confirming cases.

6 Conclusions

Cases diagnosed in the CCHF outbreak in the Omaheke Region were associated with livestock-related activities, emphasizing the increased risk of exposure among individuals who work closely with livestock and animal products. These findings highlight the importance of strengthening surveillance and preventive measures in communities where livestock farming is a major livelihood. Regular training of HCWs can improve early case detection and safe patient management. The findings also reinforce the importance of intersectoral collaboration in managing zoonotic disease outbreaks. The coordinated response contributed to timely implementation of control measures.

This investigation supports the integration of the One Health Approach in epidemic preparedness and response. Strengthening collaboration between human, animal, and environmental health sectors can enhance early detection and improve response to similar outbreaks. Although this investigation was limited by the small number of confirmed cases, the findings provide important insights into the epidemiology and response to CCHF in Namibia. We suggest future research focus on sampling ticks for CCHF prevalence, and assessing community knowledge and practices related to zoonotic disease prevention.

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