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Assessing the Prevalence & Clinical Features of Crimean-Congo Hemorrhagic Fever in Herat Regional Hospital, Afghanistan in 2024

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ABSTRACT

Background: Crimean-Congo Hemorrhagic Fever (CCHF) is a severe viral infection caused by the Crimean-Congo Hemorrhagic Fever Virus (CCHFV). We aimed to assess the prevalence of CCHFV among individuals with clinical symptoms indicative of CCHF at the Herat regional hospital, Afghanistan in 2024, which provides diagnostic and treatment services to suspected CCHF patients in western Afghanistan.
Methods: We used secondary data collected by Surveillance Department of the Afghanistan Ministry of Public Health (MoPH). Samples were collected from the provinces of Herat, Farah, Badghis, and Ghor. A retrospective cross-sectional design was employed. Participants were categorized into two groups (29 and 115 cases in each group) based on their CCHFV test results. Data included demographic information, clinical symptoms, and exposure history related to tick bites and contact with infected individuals. Statistical analysis was performed using IBM SPSS Statistics Version 25, employing Chi-square tests for categorical variables and *t*-tests for continuous variables.
Results: Among the 144 participants, 29 (19.7%) tested positive for CCHFV, with the highest incidence occurring in July. The demographic profile indicated that 65.5% of positive cases were male, with a mean age of 33.2 years. Notably, 24.1% of the positive cohort reported tick bites, indicating a possible association between tick exposure and infection rates. All participants reported headaches and fever. Statistically significant differences (P-value < 0.05) were observed in three symptoms among positive group: epistaxis (55.2%), conjunctival hemorrhage (3.4%), and vaginal bleeding (13.8%). Additionally, 93.1% of the positive group and 96.5% of the negative group received antiviral therapy.
Conclusion: The findings underscore the need for targeted public health interventions, including enhanced surveillance and community education on tick prevention.

Keywords: Crimean-Congo Hemorrhagic Fever (CCHF), Tick-borne Disease, Prevalence, Afghanistan

Introduction

Crimean-Congo Hemorrhagic Fever (CCHF) is a severe, often fatal viral infection caused by the CCHF virus (CCHFV), a tick-borne pathogen within the genus *Nairovirus* and the family Nairoviridae. The disease is known by several regional names, including Congo fever and Central Asian hemorrhagic fever, reflecting its geographical distribution. As one of the most significant tick-borne diseases worldwide, CCHF poses a major public health threat due to its high fatality rate (1,2), outbreak potential, and the absence of effective vaccines or specific antiviral treatments.

The CCHFV is endemic in more than 30 countries across Africa, Asia, and Europe, circulating primarily among domestic and wild animals, where infections are typically subclinical. Humans acquire the virus mainly through bites from infected *Hyolomma* ticks, or through contact with blood or bodily fluids of infected livestock such as cattle, sheep, and goats (3).

CCHF typically begins abruptly with high fever, severe headache, myalgia (muscle pain), arthralgia (joint pain), and gastrointestinal symptoms such as nausea, vomiting, and abdominal pain (4). As the disease progresses, patients may develop hemorrhagic manifestations including petechiae (small red spots on the skin and mucous membranes), ecchymoses (large bruises), epistaxis (nosebleeds), and bleeding from mucosal surfaces or injection sites (5). Coagulation abnormalities – particularly thrombocytopenia (low platelet count) and disseminated intravascular coagulation (DIC) – contribute significantly to disease severity (6). The clinical course generally follows four stages: incubation (1-3 days, up to 9 days), pre-hemorrhagic (2-4 days with non-specific symptoms), hemorrhagic (severe bleeding and multi-organ dysfunction, ~30% mortality), and convalescence (beginning of recovery with possible prolonged fatigue) (7, 8)

The epidemiology of CCHF is closely tied to the distribution of *Hyalomma* ticks, which thrive in warm, arid, and semi-arid environments. Seasonal tick activity (5), human-animal interactions, and agricultural practices strongly influence the transmission dynamics. Outbreaks frequently occur in settings involving livestock farming, slaughtering, and veterinary work (9), where exposure to infected ticks or animal tissues is common. Nosocomial (hospital-acquired) transmission has also been documented, highlighting the need for strict infection prevention measures in healthcare facilities (7).

CCHF is prevalent across Southern Europe, Africa, the Middle East, and Asia (10), including Afghanistan, where the virus is endemic. The first reported Afghan outbreak occurred in March 1998 in Takhar Province, with 19 confirmed cases and 12 deaths (Case Fatality Rate (CFR): 63.2%) (11). Between 2007 and 2016, the Ministry of Public Health documented 478 cases, more than half of which (55.0%) occurred in Herat (12).

During the 2024 outbreak (August 11-October 5), Afghanistan reported 1,101 suspected cases and 89 confirmed deaths, corresponding to a case fatality rate of 8.1% (13). The increasing prevalence of CCHF, particularly in regions like Afghanistan, underscores the urgent need for enhanced surveillance, public health initiatives, and research into effective vaccines and treatments. The lack of definitive therapeutic options and the limitations of healthcare infrastructure remain significant challenges in managing this disease. Ribavirin has been used in some cases, but its efficacy remains controversial (7).

CCHF remains a zoonotic disease of global significance, with major implications for public health, agriculture, and healthcare systems. Its complex transmission patterns, severe clinical manifestations, and high fatality rate highlight the need for a multidisciplinary approach to prevention and control. Epidemiological studies are essential for guiding policymakers and program managers in responding effectively to the disease. Despite multiple reports from Afghanistan, recent data on the clinical profile and risk factors of CCHF in western provinces – particularly following the 2024 outbreak – remain limited.

We aimed to assess the prevalence of CCHFV in the Herat Regional Hospital in 2024, which provides diagnostic and treatment services to suspected CCHF patients in the western region of Afghanistan, where the disease is endemic.

Materials and Methods

Study Area

We used secondary data collected by Surveillance Department of the Afghanistan Ministry of Public Health (MoPH). Samples were collected from the provinces of Herat, Farah, Badghis, and Ghor. A surveillance officer collected demographic (age, sex, occupation) and clinical information (clinical symptoms such as fever, headache, myalgia, abdominal pain, and hemorrhagic) for each patient through a pre-developed questionnaire. Patients were also queried about their exposure history, particularly contact with infected individuals, incidents of tick bites, and occupational hazards related to livestock handling. This data was then entered into an excel sheet.

Study design

We applied a retrospective cross-sectional study design to evaluate the prevalence of CCHFV among individuals exhibiting clinical symptoms consistent with CCHF. We used secondary data collected from April to December 2024.

Study Population

The participants include 144 patients exhibiting clinical symptoms consistent with CCHF including fever, headache, and abdominal pain. Participants were categorized into two groups: those who tested positive for CCHFV (N=29) via reverse transcription polymerase chain reaction (RT-PCR) test, considered the gold standard for diagnosis, and those who tested negative (N=115). The ELISA IgM test was used to confirm recent infection but was not required for the initial classification as positive.

Prior to inclusion, the surveillance officer obtained informed consent from all participants, ensuring ethical compliance. Group assignment was primarily based on the RT-PCR results, with the ELISA IgM serving as an additional confirmation.

Sample and data Collection

Samples have been already collected from suspected patients by clinical staff of the Herat regional hospital and referred to the Herat Regional laboratory for diagnosis. Blood samples were obtained from all suspected patients for RT-PCR (Reverse Transcription -PCR) and ELISA IgM (using Abbexa Kit) testing to detect CCHFV. The laboratory analyses were conducted in a facility certified by the WHO, adhering to standardized protocols to ensure the accuracy and reliability of the results. Samples were collected within a specific time frame relative to symptom onset to ensure optimal detection of CCHFV. They were stored at -80 °C and transported on dry ice to maintain integrity. Quality control measures were implemented, including the use of positive and negative controls during testing. The Abbexa ELISA kit utilized in this study has been validated by the manufacturer, with documented sensitivity and specificity provided in the manufacturer's documentation.

Statistical Analysis

Statistical analysis was conducted using IBM SPSS Statistics Version 25 (IBM Corp., Armonk, NY, USA) to summarize the demographic and clinical characteristics of the patients. The data was presented using descriptive statistics. Comparative analysis between the positive and negative groups was executed using Chi-square tests for categorical variables and *t*-

tests for continuous variables. A statistically significant difference between the groups was indicated by a *P*-value of less than 0.05.
This systematic approach facilitated a comprehensive investigation into the prevalence of CCHFV and its associated clinical manifestations, yielding valuable insights into the epidemiology of CCHF within the studied population. The findings contribute significantly to the understanding of CCHFV dynamics and inform potential public health interventions.

Result

Participant Characteristics

We included 144 patients. A total of three patients were excluded from the study because their questionnaires contained incomplete data (3 out of 147). It aimed to compare individuals who tested positive for CCHFV via RT-PCR with those who tested negatively.

Prevalence and Temporal Distribution

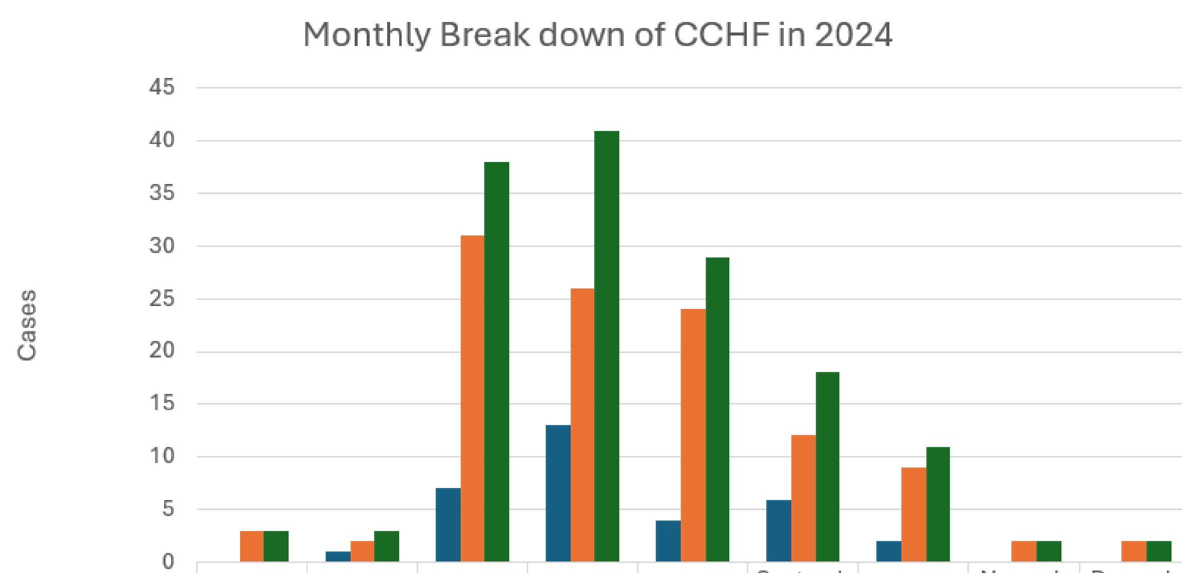
Among the participants, 29 (19.7%) were confirmed positive for CCHFV, yielding a positive rate of approximately 19.7%. This underscores a notable prevalence of the virus in the population during the study period (Table 1).

Table 1: Basic socio-demographic characteristics of the study participants

Characteristic	*CCHFV RT-PCR (+)*	*CCHFV RT-PCR (-)*	*P-Value*
	N (%)	N (%)	
Total	29(19.7)	115(78.2)	
Sex			
Male	19(65.5)	86(74.8)	
Female	10(34.5)	29(25.2)	
Age, years			
Mean (SD)	33.2(14.4)	35.9(16.1)	
Occupation			
Shepherd	5(17.2)	24(20.9)	
Butcher	3(10.3)	2(1.7)	
Housewife	8(27.6)	28(24.3)	
Farmer	7(24.2)	17(14.8)	
Health Worker	0(0)	2(1.7)	
Other	6(20.7)	42(36.6)	
Province			
Herat	27(93.2)	95(82.6)	
Badghis	0(0)	12(10.4)	
Nimroz	1(3.4)	4(3.5)	
Farah	1(3.4)	4(3.5)	
Contact with patient			
Yes	0(0)	3(2.6)	
No	29(100)	112(97.4)	
Tick Bite History			*
Yes	7(24.1)	12(10.4)	
No	22(75.9)	103(89.6)	

**P*-value = 0.051, the tick bite history is considered as barely significant

The results of monthly PCR test revealed significant fluctuations in infection rates. July exhibited the highest incidence, with 13 positive cases, indicating an increased risk of transmission during that month. Conversely, April and November recorded no positive cases, reflecting the variable nature of the disease's prevalence throughout the year (Figure 1). Overall, 115 patients tested negative, indicating that the majority of those assessed did not have CCHF.



	April	May	June	July	August	September	October	November	December
PCR Positive	0	1	7	13	4	6	2	0	0
PCR Negative	3	2	31	26	24	12	9	2	2
Total Patient	3	3	38	41	29	18	11	2	2

Figure 1: Monthly break down of CCHF cases referred to Herat Regional Hospital during 2024

Demographic and Exposure Factors

Demographic data showed that 65.5% (N=19) of the positive cases were male, while 34.5% (N=10) were female. In the negative group, 74.8% (N=86) were male and 25.2% (N=29) were female. The mean age of participants in the positive group was 33.2 yr (SD = 14.4), compared to 35.9 yr (SD = 16.1) in the negative group. Both groups were primarily composed of shepherds, farmers, and housewives, with no statistically significant differences noted. Specifically, 17.2% of the positive group identified as shepherds, compared to 20.9% in the negative group (P = 0.188) (Table 1).

Geographically, the majority of patients hailed from Herat, with 93.2% in the positive group compared to 82.6% in the negative group. Additionally, 24.1% of those in the positive group reported tick bites, compared to 10.4% in the negative group, with a P-value of 0.051, at the borderline for being statistically significant (Table 1).

Clinical Presentation and Laboratory Findings

All patients in both groups reported headaches and fever (Table 2). The majority experienced back pain (96.6% in the positive group and 99.1% in the negative group), joint pain (96.6% in the positive group and 93.9% in the negative group), nausea (82.8% in the positive group and 65.2% in the negative group), vomiting (79.3% in the positive group and 67.8% in the negative group), and thrombocytopenia (79.3% in the positive group and 67.8% in the negative group).

Table 2: Basic clinical characteristics of the study participants

Characteristic	***CCHFV RT-PCR (+) (n= 29)***	***CCHFV RT-PCR (-) (n= 115)***	***p-Value [b]***
	N (%)	N (%)	
Sign/Symptoms			
Fever [a]	29(100)	115(100)	
Headache [a]	29(100)	115(100)	
Back pain	28(96.6)	114(99.1)	
Joint pain	28(96.6)	108(93.9)	
Abdominal pain	14(48.3)	47(40.9)	
Diarrhea	17(58.6)	55(47.8)	
Nausea	24(82.8)	75(65.2)	
Vomiting	23(79.3)	78(67.8)	
Type of Hemorrhage			
Thrombocytopenia	23(79.3)	82(71.3)	
Petechial, purpura or Ecchymosis	14(48.3)	51(44.3)	
Epistaxis	16(55.2)	24(20.9)	**
Hematemesis	3(10.3)	14(12.2)	
Hemoptysis	2(6.9)	5(4.3)	
Gum bleeding	2(6.9)	4(3.5)	
Conjunctival hemorrhage	1(3.4)	0(0)	*
Hematuria	0(0)	5(4.3)	
Vaginal bleeding	4(13.8)	4(3.5)	*
Hematochezia	2(6.9)	3(2.6)	
Melana	6(20.7)	10(8.7)	
Treatment			
Antiviral therapy	27(93.1)	111(96.5)	
Supportive therapy	29(100)	114(99.1)	

[a] no statistics are computed because the variable is constant.
**P*-value <0.05, ** *P*-value <0.001
[b] All symptoms were tested, however, only those that were significant have been reported

There were statistically significant differences (*P*-value < 0.05) in reporting and diagnosing three symptoms: epistaxis (55.2% in the positive group and 20.9% in the negative group), conjunctival hemorrhage (3.4% in the positive group vs. 0.0% in the negative group), and vaginal bleeding (13.8% in the positive group vs. 3.5% in the negative group).

Treatment

Additionally, 93.1% of the positive group and 96.5% of the negative group received anti-viral therapy. Almost all participants also received supportive therapy which included treatments such as IV fluids, painkillers, and blood transfusions (Table 2).

Discussion

The study provides important insights into the epidemiology and clinical characteristics of CCHF in western Afghanistan, a region where the disease remains endemic and where systematic surveillance remains limited. The proportion of confirmed cases highlights an ongoing burden of infection and reinforce the need for sustained public health attention in Herat and neighboring provinces.
The concentration of confirmed cases during July suggests a seasonal transmission pattern consistent with the ecology of *Hyalomma* ticks, which are mostly active in hot, dry months. Similar seasonal peaks have been documented in

other endemic regions, where warmer temperatures increase tick activity and human-animal contact (14,15). This pattern underscores the importance of strengthening early warning systems and intensifying preventive measures – such as tick control and community education – during high-risk months.

The demographic patterns observed in this study point toward exposure-related risks rather than biological susceptibility. The predominance of men among confirmed cases aligns with findings from other countries where men more frequently engage in livestock handling, slaughtering, and outdoor agricultural work (16,17). Similar to findings from another study (20), the mean age of participants in the positive group (33.2 yr) indicates that younger adults are particularly susceptible, which might reflect their increased engagement in high-risk occupations.

The geographical concentration of cases in Herat reflects local ecological and socioeconomic conditions. Herat's extensive livestock trade, cross-border movement, and environmental suitability for *Hyalomma* ticks likely contribute to sustained transmission. The higher proportion of reported tick bites among confirmed cases, although borderline in statistical significance, is consistent with established evidence that tick exposure is a primary route of infection (18,19). Public health interventions should therefore prioritize vector control, personal protective measures, and safe livestock-handling practices (20). In our study, only three patients with RT-PCR (-) had contact with patients, but none of the positive RT-PCR had contact with patients.

Clinically, the prominence of hemorrhagic manifestations among confirmed cases highlights the severity of CCHF and the importance of early recognition of warning signs. Symptoms such as epistaxis and conjunctival hemorrhage, significantly more common among confirmed cases, reflect underlying coagulopathy and can rapidly progress to life-threatening complications. Similar patterns have been reported in previous outbreaks, emphasizing the need for heightened clinical awareness in endemic settings (3,21). As these symptoms lead to a high mortality rate, health care staff mainly physicians and nurses should be trained in diagnosis, case management and treatment of patients with acute symptoms in Herat regional hospital (22,23).

Widespread use of antiviral therapy reflects current clinical practice in Afghanistan, although the effectiveness of ribavirin remains debated (7). Supportive care continues to be the cornerstone of management, and improving access to blood products, monitoring tools, and trained personnel could meaningfully improve outcomes.

This study had several limitations. The hospital-based design restricts findings to symptomatic individuals seeking care, potentially underestimating community prevalence. The relatively small number of confirmed cases limits statistical power, and reliance on self-reported exposure history introduces recall bias. The absence of virological data – such as viral load or strain characterization – also limits deeper understanding of transmission patterns and disease severity. Despite these constrains, the study contributes valuable evidence from a region where data remains scarce.

Overall, the findings highlight the urgent need for strengthened surveillance, improved diagnostic capacity, and targeted public health interventions in western Afghanistan. Community education, occupational risk reduction, and vector control should be prioritized (22,24).

Conclusion

The study of CCHFV in the western region of Afghanistan reveals a significant public health concern, with a positivity rate of 19.7% among the 144 patients examined. The findings indicate notable seasonal patterns in infection rates, particularly during warmer months, and highlight the vulnerability of specific demographics, notably males engaged in agricultural activities. The association between tick exposure and infection underscores the need for targeted public health interventions, including enhanced surveillance, community education on tick prevention, and vector control strategies. Given the absence of effective vaccines and limited therapeutic options, increasing the community awareness through seasonal campaigns is essential to mitigate the impact of CCHFV and protect at-risk populations in this endemic region.

Data Availability Statement

The data used in this study was obtained from secondary sources coded to ensure participant de-identification. Due to ethical and privacy considerations, the dataset is not publicly available. However, access may be granted upon reasonable request and with appropriate data use agreements in place, subject to approval by the original data custodians.

Ethical Considerations

Prior to data use, a surveillance officer obtained informed consents from all patients, ensuring ethical compliance. This study was approved by the Ethics Committee of the Afghanistan National Public Health Institute (IRB Code: A-7-25-482). Additionally, the research was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki, as adopted by the World Medical Association for medical research involving human subjects.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article

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