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Review Article

Recent outbreaks of crimean–congo hemorrhagic fever (CCHF) In Iraq

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Abstract

Crimean-Congo hemorrhagic fever (CCHF) is a zoonotic disease that passes from animals or insects to humans. It is responsible for several deaths in humans, while the hosts, like cows, sheep, and goats are not affected. The CCHF was recognized for the first time in Iraq in 1979 where the virus was isolated from human cases and characterized. Since then, several small-scale outbreaks have been reported in 2019, 2021, and 2022. During this period, awareness workshops were conducted targeting government officials, veterinarians, medical doctors, and assistant staff. A strong collaboration strategy was put into place between these sectors together with the united nation office in Baghdad. These resulted in accelerating the implementation of the amendment of the Veterinary Medical Progression Law 2021, establishing a supreme Committee for Epidemiological Disease Control supervised by the Council of Ministers and forming a collaboration crisis cell from Baghdad and other municipalities and ministries concerned, and placed detailed safety, one health and control measures for all parties involved. The current outbreak cases reached 90 cases with 18 deaths with the majority in Thi-Qar Governorate. The current situation is difficult to deal with such a highly virulent virus due to the unavailability of an effective vaccine nor BSL-4 facility to safely deal with/handle the virus in the country.

Keywords: Arbovirus, Hemorrhagic fever, Tickborne viruses, Livestock, Iraq

Introduction

On September 3, 1979, the first instance was reported, and since then, 9 other patients have been under investigation. Eight patients disclosed prior exposure to sheep or cattle, whereas two patients - a resident physician and an auxiliary nurse - acquired diseases in the hospital from close contact with other patients. Eight of the patients resided in geographically dispersed places near Baghdad and Ramadi and had no epidemiological connection to one another. Blood samples from the patients and post-mortem liver specimens were used to isolate the virus. The isolated virus was serologically closely related, but not identical, to other members of the Congo/Crimean hemorrhagic fever virus group. In 2018, 64 cases of Crimean-Congo hemorrhagic fever were reported by the Iraqi Ministry of Health to the World Health Organization (WHO), with 7 deaths and 7 more cases being confirmed. Additionally, from April to November 2021,

the Iraqi Ministry of Health reported a total of 45 suspected cases, of which 15 were laboratory confirmed. To build a rapid response team (RRT) in field investigation and outbreak response, the WHO organized a three-day workshop in March 2022 in collaboration with the Ministry of Health in Iraq. The workshop, which was attended by 42 participants from 13 Iraqi governorates, included doctors, veterinarians, lab technicians, health workers, and zoonotic diseases investigators. In Iraq and elsewhere, RRTs have helped to contain epidemic and pandemic-prone disease outbreaks. Since 1979, the illness has been prevalent in Iraq, with only a few isolated instances being noted nationwide. Last year, small outbreaks of the fever were reported in Iraq, scaring the local population. The last outbreak, which was confirmed to have 18 cases in the Thi-Qar and Ninawa Governorates, occurred in 2021. The most recent data for the current epidemic stated that as of mid-May 2022, there were 70 cases overall, with 22 of those instances directly attributable to the

symptoms of the CCHF virus disease (WHO, 2022). Iraq has taken action in the Erbil/Kurdistan Region to contain the latest CCHF outbreak that has expanded throughout the southern regions. People can contract the CCHF virus by tick bites or contact with infected animal blood or tissues during and just after slaughter. The majority of incidents have affected those who work in the cattle business, including farmers, butchers, and veterinarians.

The Virus

The Orthonairovirus family, which is connected to the Bunyavirales order, includes the CCHF virus (Fig.1) (Virus Taxonomy, 2018). The virions are pleomorphic and range in size from 80 to 120 nanometers (nm). The nucleocapsid protein is circular and filamentous, and the genome is composed of three unique RNA sequences (small encodes the nucleocapsid protein, medium encodes the envelope glycoproteins, and large encodes the RNA polymerase). Unlike the protein envelope, which features tiny protrusions, the single-layer envelope is made up of a lipid bilayer (Ergonul, 2006; Carroll et al., 2010; Carter et al., 2012).

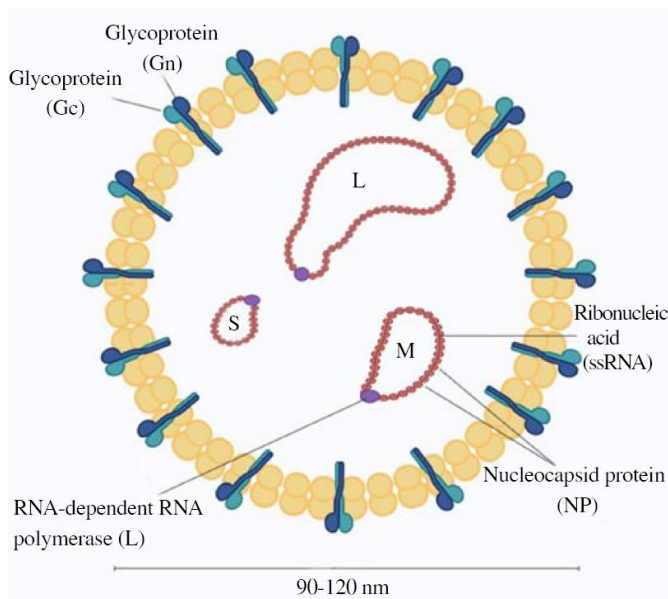


Fig. 1 CCHF viral genome structure (adapted from Hamidinejad et al., 2021).

Transmission

Transmission among vector

The prevalence of ticks, a key reservoir, and vector, is closely correlated with the spread of CCHF patients. After feeding on a host who is infected with the virus, ticks of the Hyalomma genus can transmit the disease from larva to

nymph to adult. Within some animals, the virus can also spread from mother to offspring through the ovary. Additionally, certain vector animals have shown evidence of venereal transfer, which could help to keep the virus in nature. Ticks can also contract the disease by eating on uninfected hosts while feeding on infected ticks (Wilson et al., 1991; Gordon et al., 1993; Nuttall and Labuda, 2003; Nuttall and Labuda, 2004; Aslam et al., 2016).

Transmission among small animals

Two-host ticks feed on hares and tiny birds as larvae and nymphs, but as adults, they eat cows, sheep, and other large mammals. CCHFV does not rely on birds as a host because they are resistant to becoming viremic and have no specific antibodies (Shepherd et al., 1987).

Transmission to Humans

Infected animal blood can be directly contacted by farmers, slaughterhouse workers, veterinarians, and other professionals to spread the virus to humans (Fig. 2). Additionally, direct or indirect contact with the skin, mucous membranes, or bodily fluids of infected people can result in the spread of the disease from one person to another. The virus can also spread from person to person, usually in a medical setting. Tick abundance may be impacted by climate because high temperatures, particularly in the spring and summer, may hasten the Hyalomma cycle (Shepherd et al., 1987).

Clinical Symptoms

According to Sara et al. (2015), the CCHFV infection/disease is divided into 4 stages:

1. The presymptomatic and incubation phases. A 3–7 days incubation period follows an infection.
2. A 4-5 days pre-hemorrhagic period. Headache, high temperature, cramping in the stomach, myalgia, hypotension, and flushed face are the main symptoms.
3. During the hemorrhagic phase, severe symptoms such as emesis and red spots on the skin (petechiae), blood extravasation, nose bleeding, and gum bleeding begin to manifest. Additional symptoms may include nausea, diarrhea, emesis, neuropsychiatric abnormalities, and cardiovascular alterations. Patients who are not treated for their illness run the risk of dying from multiorgan failure.
4. In survivors, the convalescent phase starts 10 to 20 days after the illness. For CCHF survivors, total recovery may require a full year.

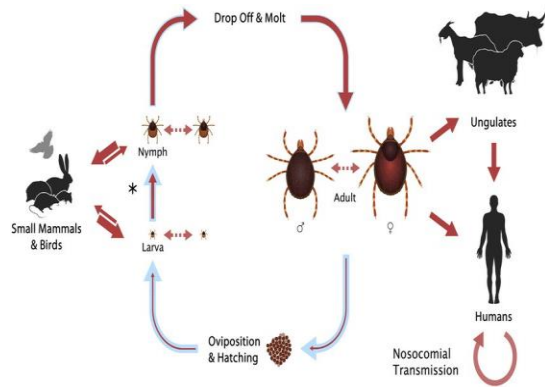


Fig. 2 Transmission pathway of Crimean-Congo hemorrhagic fever virus (CCHFV) and life cycle of the tick (adapted from Aslam et al., 2016).

Diagnostic Approaches

According to Zivcec et al. (2018) and Mazzola and Kelly-Cirino (2019), the following laboratory tests are currently used to diagnose CCHF:

1. The diagnosis of CCHF is a crucial step in patient management and infection control. Because the clinical symptoms, particularly in the early stages of the disease, are non-specific, the essential diagnosis of CCHF is based on laboratory techniques.

2. Serological tests are the most used diagnostic tools. The complexity of molecular tests, their relatively high expenses, and the need for well-trained personnel, especially in remote areas with poor infrastructure facilities, are other problems concerned with these techniques. The variability of the virus genome is about 20%, whereas that of the NP is about 8%, and that is why the serological tests are preferred to the molecular method, particularly in early-stage detection and Point of Care testing. Immunofluorescence assay (IFA), Antigen-capture enzyme-linked immunosorbent assay (ELISA), and detection of antibodies by ELISA (IgG and IgM). Later in the course of the disease, in people surviving, antibodies can be found in the blood. But antigens, viral RNA, and viruses are no more present and detectable.

3. Molecular methods using viral RNA sequences (RT-PCR) in blood or tissues from a fatal case, and virus isolation RT-PCR is used to diagnose CCHF because it detects active infection at the earliest time point. CCHFV's high diversity and in situ evolution may make lineage detection difficult, especially for RT-PCR assays that use a conserved genomic sequence. Minor genomic variations affect serological detection less. Given the variety of CCHFV strains, nucleic acid amplification tests (NAAT, such as RT-PCR) are recommended for maximum detection sensitivity. However, many low-resource settings may not have the capacity for PCR testing, especially in the early stages of an outbreak. Due to BSL-4 requirements, virus isolation is rarely used as a diagnostic tool.

4. Immunohistochemical staining can reveal viral antigens in formalin-fixed tissues.

Control Measures

Because there is currently no vaccine for CCHF, the only way to reduce CCHF infection is to increase public awareness of the disease's risk factors and potential preventive actions such as limiting virus exposure and containing disease spread. Controlling CCHF infection in animals and ticks is difficult because the tick's life cycle goes unnoticed by animals, the infection is typically undetectable in animals, and only viremia occurs. Avoiding tick-infested areas and taking extra precautions during tick season can reduce the likelihood of tick-to-human transmission. Butchers, veterinarians, and shepherds can limit their exposure to virus-infected ticks or virus-contaminated animal blood and tissues by wearing gloves and avoiding direct skin contact with the fresh-blooded animal and other tissues. To reduce the population of infected ticks, use acaricides on livestock, commercially available insect repellents such as diethyl toluamide on exposed skin, and permethrin spray on clothing to prevent tick bites. To reduce the risk of transmission from an infected human to human, medical professionals should use standard barrier nursing techniques and isolate the patient (Whitehouse, 2004). They should also avoid close physical contact with the infected person and frequently wash their hands. When visiting and tending to patients, healthcare providers must wash their hands frequently and properly (WHO, 2013), and when they are closer than three feet to the patient, they must use surgical masks, high-efficiency air respirators, face shields, safety goggles, and other protective gear (Leblebicioglu et al., 2012). Follow proper burial procedures and use only disposable tools and supplies, such as syringes and needles (Lloyd and Perry, 1998). Disinfectants such as 2% glutaraldehyde and 1% hypochlorite can be rendered inactive by heating at 56°C for 30 minutes (Appannanavar and Mishra, 2011). Only thoroughly cooked food should be consumed, and raw milk should never be consumed.

When importing animals, precautions should be taken to prevent animal-to-human transmission, and they should be frequently treated with insecticides. Additionally, maintaining hygienic conditions while butchering animals at home or in slaughterhouses. The handling of meat requires the wearing of gloves. After an animal has been killed, the utensils and other equipment should be cleaned before being reused (WHO, 2013).

Conclusions

CCHF is a zoonotic disease caused by a highly virulent tick-borne virus. This disease is endemic in Iraq since 1979 with recurrent outbreaks in 2019, 2021, and 2022 with the current cases reached to more than 90 with 18 deaths. The slaughtering practices outside the abattoir are common.

During the current crisis, veterinary measures were taken in all Iraqi governorates to conduct a spraying campaign and control measures using pesticides to combat ticks and to implement a national control policy measure considering the limited resources.

Conflict of Interest

The author hereby declares no conflict of interest.

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