CRIMEAN CONGO HEMORRHAGIC FEVER: A BIOLOGICAL WEAPON

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ABSTRACT

Crimean Congo Hemorrhagic Fever (CCHF), one of the most severe human viral diseases, has a death rate of up to 30%. The highly pathogenic nature of the virus and rapidly fatal course of the disease indicate the need for prompt and effective measures for management of victims of the disease.

Key-words: CCH Fever, viral disease, pathology, diagnosis, prevention

ETIOLOGY AND PATHOLOGY

CCHF virus belongs to the family Bunyaviridae genus Nairovirus and causes severe hemorrhagic symptoms in humans. The virus contains RNA and is inactivated by lipid solvents and detergents (Papa and Kouidoi, 2002; El-Azazy and Scrimgeour, 1997). Historically, the term viral hemorrhagic fever (VHF) has referred to a clinical illness associated with fever and a bleeding diathesis caused by a virus belonging to one of four families: Filoviridae, Arenaviridae, Bunyaviridae and Flaviviridae (Fisher et al., 1992; Geat et al., 1982; Simpson et al., 1967).

The CCHF virus is transmitted to human and animals through ticks, which acts as reservoir and vector of the virus both. All the 32 members of the Nairovirus genus are transmitted by ixodid ticks or argasid, but only three have been implicated as cause of human disease. The Dugbe Nairobi sheep virus and CCHF are the most important human pathogen amongst them. The most efficient and common vectors for CCHF appear to be member of the Hyalomma genus. The virus is introduced in ticks from infected small vertebrate on which immature Hyalomma ticks feed. Once infected the tick remains infected through out its developmental stages, and the mature tick may transmit the infection to large vertebrate, such as livestock. Domestic ruminant animals, such as cattle’s, sheep and goats are viremic for around one week after becoming infected. Humans can acquire the virus from direct contact with blood or other infected tissues from livestock during this time (Burt et al., 1996).

EPIDEMIOLOGY

CCHF virus is the causative agent of a severe human hemorrhagic fever with mortality rates ranging from 15–60%. CCHF is thought to be an old disease with reports from Southeastern Russia as early as the 12th century. The group of hemorrhagic fever diverts the attention internationally during the year 1944 – 1945 (Hoogstraal, 1979) after an outbreak in the Asia in Crimea Peninsula (Western Crimea region of the former Soviet Union) (Leshchinskaya, 1965). The isolated agent, Crimean hemorrhagic fever virus, was indistinguishable from Congo virus, which was isolated in 1956 (Casais 1969; Chumakor et al., 1970) from a febrile child in Stanley Ville (now Kisangani, Democratic Republic of the Congo), leading to the current designation, CCHF virus (Ali Mehrabi et al., 2002). Afterwards the causative agent was recognized and identified as Congo virus, isolated in Zaire, hence the name Crimean Congo hemorrhagic fever. This name was assigned by CDC in 1957. In 1967, 12 cases of a feverish illness with similar signs and symptoms of CCHF were observed, of which 5 were diagnosed as infection in the laboratory and the virus was isolated after inoculation of newborn mice with sera from infected patients. It was also observed that these viruses were serologically indistinguishable from those isolated in 1956, and this type of Congo virus was also similar to other virus strains from Central Asia, USSR and Bulgaria (Simpson, 1967). Now the disease has been reported from more than 30 countries in Africa, Asia, Southeast Europe and the Middle East. Primarily CCHF is a zoonosis affecting livestock and ground feeding birds like Ostriches (Faye et al., 1999).

The disease is endemic in many countries of Africa, Europe and Asia during the year 2001, outbreaks or cases have been reported from Iran, Pakistan, South Africa, Kosovo and Albania. In Pakistan, the first diagnosed case of CCHF was reported in 1978 (Burney et al., 1980). Most cases were reported from Balochistan while two were reported from Karachi in 2001. According to World Health Organization (W.H.O.) fact sheet, 75 people were admitted to Pakistan (Quetta) infected with suspected cases of CCHF during the year 2001 (Sagoe et al., 2001). A special new ward was opened in Quetta for the management of these cases. The samples were collected and sent to National Institute of Health (N.I.H) Islamabad. The total number of suspected cases reported was 41 with 12 deaths.
An additional 6 cases with two deaths were brought from Afghanistan who were treated in Pakistan (Altai et al., 1998).

During September to December 2000, 29 patients, with clinical illness suggesting CCHF, were admitted to The Aga Khan University Hospital Karachi, Pakistan (A 647 bed private tertiary care: academic teaching hospital that provides services not only the resident of Karachi but also all over the Pakistan). The out break was first identified after the death of a hospital health care worker involved in the care of 40 years old butcher admitted to the hospital with gastrointestinal bleeding (Smego et al., 2004).

The widespread geographical distribution of CCHF virus, its ability to produce severe human disease with high mortality rates, and fear about its intentional use in a bioterrorism attack make CCHF virus an extremely important human pathogen and a worldwide public health concern.

TRANSMISSION

The CCHF virus is transferred to human in one of the three ways:

- From a single tick bite or through simply penetration of the skin to the blood system if a tick is crushed.
- Through contact with blood from a butchered animal infected with the virus.
- Through body fluid e.g., urine, saliva, tears etc.

The populations at risk are those involved with the livestock industry, like agricultural workers, slaughterhouse workers and veterinarians, doctors, paramedical staff and close contacts of patients. Nosocomial spread with high mortality are common during the outbreak (Dunster et al., 2002). It is well described in recent reports from Pakistan, Dubai and South Africa. Available evidence, including recently unpublished experience suggests that blood and other body fluids are highly infectious (Altai et al., 1998; Khan et al., 1997; Burt et al., 1996 and Sulaiman et al., 1980). The most important transmitters of the infection to man are species of the genus Hyalomma, the life history of which is shown below.

![Life cycle of Hyalomma](image)

**Fig.1. Life cycle of Hyalomma (James and Gear 1982 SAMJ)**

CLINICAL FEATURES

The incubation period of CCHF virus after bite of tick is usually 2-7 days, with the maximum of 9 days (James and Gear, 1982). The incubation period following contact with infected blood or tissues is usually 5-6 days, with maximum of 13 days. The disease is characterized by onset of fever with muscle pain, dizziness, neck stiffness, backache, headache, sore eyes and photophobia. There may be nausea, vomiting and sore throat accompanied by
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Diarrhea and generalized abdominal pain. Later on there may be mood changes i.e., confusion and aggressiveness followed by sleepiness, depression and lassitude, the abdominal pain localized to the right upper quadrant, with hepatomegaly. The heart rate increases, the lymph nodes becomes enlarged and the bleeding tendency markedly increased visualized by a petechial rashes. There is also meleana haematuria, epistaxis and bleeding from the gums. The severely ill patients may develop hepatorenal and pulmonary failure after the 5th day of illness. The mortality rate is approximately 30 % with death occurring in the 2nd week of illness. The patients who survive recovery begin on the 9th day after the onset of illness (Van et al., 1985; Joubert et al., 1985).

In 2003, Nadir and coworkers observed that most of the clinical features and laboratory findings of CCHF and malaria (caused by Plasmodium falciparum) resembles each other but the frequency of manifestation of disease differs.

CCHF virus is most often transmitted to man by a tick bite however; an increasing number of cases have occurred among medical, laboratory and nursing staff in hospital. In Nosocomial cases, the infections have apparently been acquired by contact with patients’ blood or blood contaminated specimens. Nosocomial transmission was reported from Pakistan (Burney et al 1980), Iraq (Al-Tikriti et al., 1981), Dubai (Sulaiman et al., 1980) and South Africa (Van DeWal et al., 1985).

DIAGNOSIS

Early diagnosis and strict blood and body fluid infection control precautions were supposed to be essential to limit exposure to caregivers. Diagnosis requires isolation of the virus from the blood during first week of illness or detecting rising antibody titer by immuno fixation antibody, compliment fixation or enzyme linked immuno sorbent assay (ELISA) (Shepared et al., 1985). The diagnosis is also based on epidemiologic studies and clinical presentation. It is confirmed in a reference laboratory by a rise in specific IgG or IgM titers using ELISA (Anonymous, 2001a). Hyperbilirubinemia and elevated liver enzymes are common (Susan and Boyer, 2001). The non specific laboratory abnormalities include progressive neutropenia, lymphopenia, thrombocytopenia and anemia (Swanepoel and Shepared, 1985). Detection of viral nucleic acid by RT-PCR will be done for confirmation of suspected cases (Swanepoel, 1995).

TREATMENT

Treatment is supportive and may require intensive care. Intensive monitoring to guide volume and blood component replacement is required. The antiviral drug ribavirin inhibits CCHF virus in vitro, but its efficacy in clinical practice remains unconfirmed (Susan and Boyer, 2001).

PRECAUTIONS

No safe vaccine is available (Swanepoel, 1995). Killing of ticks with acaricide is only realistic option (Anonymous, 2001b). Protective measures in endemic areas using repellent should be practiced DEET is a good tick repellent wearing gloves while handling live stock is advocated. Suspected patients should be isolated and cared for using barrier nursing techniques (Iffat et al., 2002).

Simple precaution is made for prevention of Nosocomial infection such as barrier nursing will reduce the spread. Administration of prophylaxis with oral Ribavirin after exposure was offered to any one at high risk for exposure: those who were directly exposed to the blood of CCHF patients via needle stick injury or contact. 9 patients were suffering from CCHF during the year 2000, although they were treated with Ribavirin, out of 9 patients, 5 (56%) were died (Smego et al., 2004).

CONCLUSION

Prompt diagnosis and early detection for confirmation of the disease can prevent the mortality rate. Notification plays a fundamental role in the control of CCHF. As it is a notifiable disease, all suspected and confirmed cases should be reported to health department for further spread and prevention of the disease.

REFERENCES


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