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Crimean Congo Haemorrhagic Fever

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ABSTRACT

Crimean Congo haemorrhagic fever is zoonotic disease spread by tick vector mostly of genus *Hyalomma* and caused by arbovirus Crimean Congo haemorrhagic fever virus (CCHFV). An RNA virus of family Bunyaviridae. Host range include humans, wide range of domestic and wild animals and birds. CCHFV transmits to humans by ticks and by animals and in humans, horizontal transmission by blood, saliva and semen has also been observed. In ticks, vertical transmission of virus occurs. Incubation period ranges from 3-13 days and mortality from 10-40%. Disease results in fever, headache, myalgia, photophobia, dizziness, abdominal pain, diarrhea, vomiting, rashes and hemorrhages etc but in severe cases multi organ failure, shock and finally death. CHF was first discovered in 1944 in Crimea in military staff. CCHF can be diagnosed by RT PCR, ELISA, IFA and rarely by virus isolation. Laboratory test results in leukopenia, thrombocytopenia and coagulation abnormalities. No specific treatment but supportive treatment is given in CCHF and antiviral agent (Ribavirin) to stop virus replication. Different preventive measures are taken to control CCHF like regular skin examination, tick repellent, use proper personal protective equipments and disinfectants etc.

Introduction

Crimean Congo haemorrhagic fever (CCHF) is a disease caused by ticks and it is a deadly zoonotic disease. Causative agent of CCHF is arbovirus Crimean Congo haemorrhagic fever virus (CCHFV), member of Nairovirus genus and Family Bunyaviridae and is an RNA virus [1]. The principal cause of CCHF are ticks of genus *Hyalomma*. Host range of this virus involves humans, wide range of wild and domestic animals and Birds. Mortality rate is 10-40% [2]. This disease was identified first time in agriculture workers when a large outbreak occurs in mid of 1940s in Crimean Peninsula. Some important factors which play important role in spread of disease includes exchange and trade of animals between countries, direct contact with infected ticks, blood and tissues of infected animals, transmucosal and conjunctival inoculation of an infectious agent from patient to their family members, health care workers and doctors and migratory birds also help in transmission of vector. Incubation period varies from 3 to 13 days depending on the route of infection [2].

This disease results in fever, headache, dizziness, photophobia, myalgia, diarrhea, increased heart rate, lymphadenopathy, arthralgia, abdominal pain, vomiting, rashes and hemorrhages on multiple organs result in death in some days [3]. ELISA and RT PCR are used to confirm cases of CCHF. Until now, no specific treatment is available but supportive treatment and antiviral agent Ribavirin is given in suspected cases. In Pakistan, this disease was first time reported in 1976. Sporadic cases reported in Pakistan mostly in Balochistan and KP province because of cross border trade and migration of animals and human beings.

Detection and Naming of Virus

Crimean hemorrhagic fever (CHF) was first discovered as clinical case in 1944 [4], when 200 Soviet military staff became infected and damaged by war of Crimean. After some time Chumakov and his colleagues became successful in proving that Crimean hemorrhagic fever (CHF) is a viral disease caused by ticks, by inoculating mental patient and military volunteers with patient's serum ultrafiltrates or extracts of combined ticks. In 1967 critical development in CHF research came when Chaumakov's group found that newborn mice developed fatal illness when injected with samples from CHF patient or infected ticks. The resulting Drosdov strain, isolated by this method from the patient (Drosdov) in Astrakhan became the protype strain for much experimental work in Russia and other areas. Some agents of tick-borne hemorrhagic fevers from Uzbekistan and Kazakhstan and from different areas of Africa were found to be identical from each other. Further work shows that Crimean hemorrhagic fever was almost antigenically identical with Congo virus [5], isolated from human patient from Congo. Both viruses are same and gave new name Crimean Congo haemorrhagic fever virus.

Transmission

- **Transmission to human by ticks and animals:** Animals act as carrier of CCHFV but cause infection to humans [6]. Humans get infection by direct contact with tissues and blood of animal infected with CCHFV. Infected tick bite to human also cause infection in human.
- **Human to human transmission:** Humans get infected when exposure to tissues and blood of infected human. This occurs primarily in hospitals and cause nosocomial infection. There are chances of horizontal transmission from mother to child [7].
- **Vertical transmission:** In ticks virus transfer from adult female to male during mating and from adult female to their eggs. The virus replicates in their mid-gut lining and spreads to salivary gland and reproductive organs [8]. So large population of infected ticks are produced by infected female tick.
- **Horizontal transmission:** When the virus enters in humans by direct contact or tick bite the person-to-person transmission is observed through saliva, blood and semen of infected person to healthy one [9].

Diagnosis

Laboratory test for CCHF diagnosis include immuno-fluorescence assay (IFA), antibody (IgG and IgM), reverse transcriptase (RT PCR), virus isolation and ELISA. RT PCR is highly sensitive to detect CCHF at early stage. For detection of CCHF with highest sensitivity use immuno-fluorescence assay in combination with nucleic acid amplification test (NAAT). For detection of CCHF virus isolation is rarely used because for this BSL 4 is required [10].

Clinical Findings of CCHF

Infection with CCHFV results in mild, non-specific illness, in some cases severe hemorrhages occur. In 1944 when Crimean outbreak occurs, hospitalized patients show signs like fever, myalgia, weakness, headache, hyperemia of face and oropharynx, vomiting, rashes with ecchymoses and bleeding from GIT, nasopharynx, and other sites also. CCHF divided into 4 phases:

- Incubation phase
- Pre hemorrhagic phase
- Hemorrhagic phase
- Convalescent phase

Incubation phase varies from 3 to 13 days depending on the route of infection like 3 days if tick bites, 5-6 days if contact with infected tissues and blood of livestock or human.

Pre hemorrhagic phase includes fever, lassitude and non-specific signs and symptoms.

Hemorrhagic phase starts on day 3-5 after illness. This phase starts initially with pinpoint rashes on skin, mucous membrane of eye and other mucous membranes which further continue to ecchymoses and blood comes from urinary and gastrointestinal tracts, hepatomegaly

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and splenomegaly. In fatal cases following hemorrhages, multi organ failure and shock, death of patient occurs.

Convalescent phase or recovery phase may take up to a year [11].

Laboratory Findings of CCHF

In hematology testing leukopenia, development of thrombocytopenia in early stage of infection. In fatal cases platelets count is very low, hemoglobin level also falls, abnormalities occur in coagulation with activated partial thromboplastin time (APTT) and prothrombin time (PT) is lengthened. Liver associated enzymes, aspartate, alanine and aminotransferase (ALT and AST) levels in the serum increases in CCHF [12].

Treatment

No specific treatment is available but supportive treatment must be given to the patient which includes administration of erythrocytes, thrombocytes and fresh frozen plasma to control CCHF at early stage. Ribavirin is an effective drug and antiviral agent against CCHFV because it stops the virus replication.

Vaccine

Inactivated preparation of virus grown in neonatal mouse brain is the only vaccine for CCHFV. This vaccine used only in Bulgaria and not approved in other countries [13].

Control and Preventive Measures

Minimize tick burden in livestock and vertebrate hosts. Regular examination of skin for tick and use tick repellents. Fully covered clothing and gloves when deal with skin and mucous membranes of viremic animals. Avoid intake of unpasteurised milk and uncooked meat. To prevent human to human transmission while dealing with patient use proper PPEs like gloves, gowns, face shields and goggles. Safe burial of patient and disinfect with liquid bleach solution and covering in polythene bag. Virus isolation carried out in labs where BSL 4 is available. CCHFV can be inactivated by heating for 30 min at 56°C, 2% glutaraldehyde and 1% hypochlorite [14].

References

[1] Farhadpour F, Telmadarraiy Z, Chinikar S, Akbarzadeh K, Moemenbellah-Fard MD, Faghihi F, Fakoorziba MR, Jalali T, Mostafavi E, Shahhosseini N, Mohammadian M. Molecular detection of Crimean–Congo haemorrhagic fever virus in ticks collected from infested livestock populations in a New Endemic Area, South of Iran. Tropical Medicine & International Health. 2016 Mar;21(3):340-7.

[2] Fletcher TE, Leblebicioglu H, Bozkurt I, Sunbul M, Bilek H, Asik Z, Barut S, Gunes F, Gemici U, Hewson R, Wilson D. Rotational thromboelastometry alongside conventional coagulation testing in patients with Crimean–Congo haemorrhagic fever: an observational cohort study. The Lancet Infectious Diseases. 2019 Aug 1;19(8):862-71.

[3] Whitehouse CA. Crimean–Congo hemorrhagic fever. Antiviral research. 2004 Dec 1;64(3):145-60.

[4] Watts DM, Ksiazek TG, Linthicum KJ, Hoogstraal H. Crimean-Congo hemorrhagic fever. The arboviruses: epidemiology and ecology. 2019 Jun 4:177-222.

[5] Casals J. Antigenic similarity between the virus causing Crimean hemorrhagic fever and Congo virus. Proceedings of the Society for Experimental Biology and Medicine. 1969 May;131(1):233-6.

[6] Messina JP, Pigott DM, Golding N, Duda KA, Brownstein JS, Weiss DJ, Gibson H, Robinson TP, Gilbert M, William Wint GR, Nuttall PA. The global distribution of Crimean-Congo hemorrhagic fever. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2015 Aug 1;109(8):503-13.

[7] Saijo M, Tang Q, Shimayi B, Han L, Zhang Y, Asiguma M, Tianshu D, Maeda A, Kurane I, Morikawa S. Possible horizontal transmission of Crimean-Congo hemorrhagic fever virus from a mother to her child. Japanese journal of infectious diseases. 2004 Apr 1;57(2):55-7.

[8] Aslam S, Latif MS, Daud M, Rahman ZU, Tabassum B, Riaz MS, Khan A, Tariq M, Husnain T. Crimean-Congo hemorrhagic fever: Risk factors and control measures for the infection abatement. Biomedical reports. 2016 Jan 1;4(1):15-20.

[9] Spengler JR, Estrada-Peña A, Garrison AR, Schmaljohn C, Spiropoulou CF, Bergeron É, Bente DA. A chronological review of experimental infection studies of the role of wild animals and livestock in the maintenance and transmission of Crimean-Congo hemorrhagic fever virus. Antiviral research. 2016 Nov 1;135:31-47.

[10] Ergonul O. Crimean–Congo hemorrhagic fever virus: new outbreaks, new discoveries. Current opinion in virology. 2012 Apr 1;2(2):215-20.

[11] Aftab S, Rai N, Baig A, Crimbly F, Fernandes N. Outbreak of Crimean-Congo Hemorrhagic Fever (CCHF) During Eid-ul.

[12] Rathore SS, Manju AH, Wen Q, Sondhi M, Pydi R, Haddad I, Hasan J, Ali MA, Tousif S, Singh R, Muhammed AA. Crimean-Congo haemorrhagic fever-induced liver injury: A systematic review and meta-analysis. International Journal of Clinical Practice. 2021 Nov;75(11):e14775.

[13] Pavel ST, Yetiskin H, Kalkan A, Ozdarendeli A. Evaluation of the cell culture based and the mouse brain derived inactivated vaccines against Crimean-Congo hemorrhagic fever virus in transiently immune-suppressed (IS) mouse model. PLoS Neglected Tropical Diseases. 2020 Nov 23;14(11):e0008834.

[14] Fadaei A. Viral inactivation with emphasis on SARS-CoV-2 using physical and chemical disinfectants. The Scientific World Journal. 2021 Oct 25;2021.