International Journal of Research in Medical Sciences
Agravat VJ et al. Int J Res Med Sci. 2014 May;2(2):392-397
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: 10.5455/2320-6012.ijrms20140504

Review Article

Crimean-Congo haemorrhagic fever: an overview

Virat J. Agravat[1], Sneha Agarwal[2]*, Kiran G. Piparva[2]

[1]Medical Officer, Primary Health Centre, Kotdapitha, Babra, Amreli, Gujarat, India
[2]Department of Pharmacology, PDU Govt. Medical College, Rajkot, Gujarat, India

Received: 12 February 2014
Accepted: 1 March 2014

***Correspondence:**
Dr. Sneha Agarwal,
E-mail: agarwal_sneha85@yahoo.com

ABSTRACT

Crimean-Congo Hemorrhagic Fever (CCHF) is an acute, highly-contagious and life-threatening vector borne disease. The CCHF virus causes severe viral hemorrhagic fever outbreaks, with a case fatality rate of 10-40%. CCHF virus isolation and/or disease has been reported from more than 30 countries in Africa, Asia, South eastern Europe and Middle east. Jan 2011 marks first ever reports of outbreak of CCHF in India, total 5 cases were detected of CCHF from Gujarat. CCHF has recently in news again, 6 human cases and 32 animal samples test positive for CCHF from Kariyana village of Amreli district (Gujarat state) July 2013. Crimean-Congo hemorrhagic fever virus (CCHFV), member of genus Nairovirus in the family Bunyaviridae. Numerous genera of ixodid ticks serve both as vector and reservoir for CCHFV. Human infections occurred through tick bites, direct contact with blood or tissue of infected livestock, or nosocomial infections. Human infections begin with nonspecific febrile symptoms, but progress to a serious hemorrhagic syndrome with a high case fatality ratio. The most definitive way of diagnosis is the demonstration of virus or viral genome in sera samples. Hospitalization in special care unit with constant effort to prevent haemorrhagic complication along with laboratory monitoring is cornerstone for treatment of CCHF. Till date there is no FDA approved drug or definitive treatment for CCHF, ribavirin is tried by many physician need to be evaluated further. Current article is an effort to update existing knowledge about CCHF by due focus on various aspects especially prevention of this zoonotic disease. Much of the real life queries about this disease are elaborated after extensive literature research.

Keywords: CCHF, Zoonotic disease, Hemorrhagic fever, Ribavirin

INTRODUCTION

Crimean-Congo Hemorrhagic Fever (CCHF) is an acute, highly-contagious and life-threatening vector borne disease.[1] CCHF was first recognized in Crimean Pennisula in 1944 and was first isolated at Congo in 1956. There by the current name was adapted for virus and of disease caused by it.[2] The CCHF virus causes severe viral hemorrhagic fever outbreaks, with a case fatality rate of 10-40%.[3] Since its discovery in 1967, nearly 140 outbreaks involving more than 5,000 cases have been reported all over the world.[4] CCHF virus isolation and/or disease has been reported from more than 30 countries in Africa, Asia, south eastern Europe and middle east.[5] Although confirmed CCHF patient or serological evidence of the virus were being reported from neighbouring countries, Pakistan reporting 50-60 cases annually.[2] There had been no CCHF case before 2011 in India. During December 2010, national institute of virology, Pune detected Crimean-Congo hemorrhagic fever virus specific IgG antibodies in livestock serum samples from Gujarat and Rajasthan states.[6]

The geographic range of CCHF virus is the most extensive one among the tick-borne viruses that affect

human health, and the second most widespread of all medically important arbo viruses, after dengue virus.[4]

Status in India

Developing countries such as India suffer disproportionately from the burden of CCHF given the confluence of existing environment, socio-economic and demographic factors.[7] The emergence of this deadly viral infection in a huge country like India having all ecological suitability for the virus is a challenge for the entire medical fraternity.[4] Jan 2011 marks first ever reports of outbreak of CCHF in India, total 5 cases were detected of CCHF from Gujarat.[8] CCHF has recently in news again, 6 human cases[9] and 32 animal samples[10] test positive for CCHF in test done by National Institute of Virology (NIV) Pune, from Kariyana village of Amreli district (Gujarat state) July 2013. The village has around 5000 population and their main occupation is animal husbandry and agriculture. Amreli district is one of the 26 administrative districts of the state of Gujarat in western India.[11]

CCHF outbreak constitute a threat to public health because of its epidemic potential, its high case fatality ratio, its potential for nosocomial outbreaks; and the difficulties in treatment and prevention.[12]

EPIDEMIOLOGY

Causative agent

Crimean-Congo hemorrhagic fever virus (CCHFV), member of genus Nairovirus in the family Bunyaviridae.[3] CCHF virus is a spherical enveloped virus with approximately 100nm diameter and has glycoprotein spikes 8-10nm in length. Under electron microscopy, the virion of CCHF can be distinguished from other members within the Bunyaviridae family, as they possess small morphologic surface units with no central holes arranged in no obvious order.[4]

Vector and reservoir

Numerous genera of ixodid ticks serve both as vector and reservoir for CCHFV; however occurrence of CCHF closely approximates the known world distribution of ticks in the genus Hyalomma spp. ticks.[13] The most important source for acquisition of the virus by ticks is considered to be infected small vertebrates on which immature Hyalomma ticks feed.[14] Once infected, the tick remains infected through its developmental stages and the mature tick may transmit the infection to large vertebrates, such as livestock. Domestic ruminant animals, such as cattle, sheep and goats are remained viraemic (virus circulating in the bloodstream) for around one week after becoming infected, allowing the tick-animal-tick cycle to continue when another tick bites. Differences in tick feeding preferences and vertebrate host availability in the various regions will likely mold the evolutionary landscape of the virus.[15]

Host

Human beings are the only host of CCHF in whom the disease manifestations are visible [(4)]. Reservoir host are nares and Hyalomma ticks where as domestic animals act as amplifying host.[2]

Human acquire the infections through tick bites, direct contact with blood or tissue of infected livestock, or drinking unpasteurized milk.[3] Human-to-human transmission is possible and is an important route in a nosocomial set up when skin or mucous membranes are exposed to blood and body fluids of patients with haemorrhage.[4]

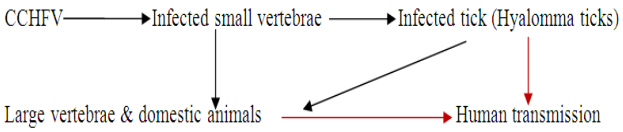

Figure 1: Transmission cycle of CCHFV.

Risk factors

a) History of tick bite
b) Having contact with livestock
c) High risk occupations (butchers, physicians, veterinarians) are important risk factors in CCHF.

This majority of cases have occurred in people involved in the livestock industry, such as agricultural workers, slaughterhouse workers and veterinarians.[3] Izadi et al. stated that even occasional contact with livestock could be effective in transmission of virus.[16]

Many birds are resistant to infection, but ostriches are susceptible.[3] Shepherd et al. reported death of an ostrich abattoir from CCHHF, confirmed by isolation of CCHF virus from the patient's serum and by demonstration of a specific antibody response.[17] It was suspected that infection was acquired either by contact with ostrich blood or by inadvertently crushing infected Hyalomma ticks while skinning ostriches.

Increasing number of cases have occurred among the medical and nursing staff caring for patients in hospital and in laboratory personnel carrying out investigations of these patients. In these cases the infection has apparently been acquired by contagion, particularly by contact with the patient's blood or blood-contaminated specimens.[18] Indeed, two cases of nosocomial contamination (a doctor and a nurse) were reported in 2011 in India following the hospitalization of a CCHFV infected patient.[19] Naderi et al. also reported a nosocomial spread of CCHF in north-eastern Iran to a medical student who died within 1 week of exposure.[20] Zavitsanou et al. stated that most dangerous conditions for acquiring CCHF in nosocomial

setting are interventions for controlling gastrointestinal bleedings and emergency operations in patients who have not been diagnosed with CCHF virus before operation.[21] CCHF has also occurred in hospitals due to improper sterilization of medical equipment, reuse of injection needles, and contamination of medical supplies.[22]

Masayunki et al. stated the possibility of horizontal transmission of CCHF virus from mother to child.[23]

As for all vector-borne diseases, environmental factors, climate and human behaviour are critical determinants for the establishment and maintenance of CCHF endemicity in an area. Dikid et al. stated that changes in climatic conditions is one of the factors that has facilitated survival of a large no of Hyalomma spp. Ticks and of the hosts of both immature and adult stages and consequently increase incidence of CCHF.[7] Kara et al. states that global warming will make the world as a better place for parasites, biting flies or ticks which serve as vectors of diseases remain alive throughout the year and that increases the risk of occurrence of CCHF.[24] Zavitsanou et al. stated that high mortality rates of CCHF may imply its usage as bioterrorism agent.[21] CCHF virus has been listed in US as an CDC/NIAID Category C priority pathogen.[25]

CLINICAL MANIFESTATIONS

The typical course of CCHF infection has four distinct phases - incubation period, prehaemorrhagic phase, haemorrhagic phase, and convalescent phase.[4]

The length of the incubation period depends on the mode of acquisition of the virus.[3]

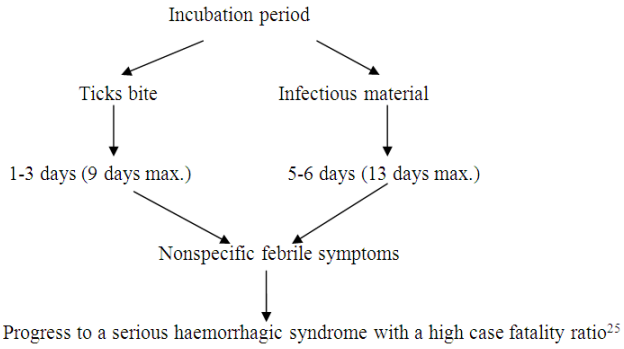

Figure 2: Incubation period of CCHF infection.

The onset of prehaemorrhagic phase is sudden, with initial signs and symptoms including headache, high fever, back pain, joint pain, stomach pain, and vomiting [(26)] similar to other viral illness lasting for 4-5 days. Red eyes, a flushed face, a red throat, and petechiae (red spots) on the palate are common. Symptoms may also include jaundice, and in severe cases, changes in mood and sensory perception. As the illness progresses, haemorrhagic phase evident in the form of large areas of severe bruising, severe nosebleeds, conjuctival haemorrhage, uncontrolled bleeding at injection sites, hematemesis and melena can be seen.[27,28] There is usually evidence of hepatitis, and severely ill patients may experience rapid kidney deterioration, sudden liver failure or pulmonary failure after the fifth day of illness.[3] There is no relation between the temperature of the feverish patient and the onset of haemorrhage.[29] In patients who recover, improvement generally begins on the ninth or tenth day after the onset of illness.[3] In the survivors, the convalescent period begins 10-20 days after the onset of illness. During this phase, patients may have feeble pulse, tachycardia, loss of hearing, and loss of memory and hair. However, these after effects have been reported only in few outbreaks.[4,30] There is no known relapse of the infection.[21]

In documented outbreaks of CCHF, fatality rates in hospitalized patients have ranged from 9% to as high as 50%.[26] High mortality rate in nosocomial infection than after tick bite is related to virus dose.[25]

Clinical picture of CCHF are non-specific and overlap with other tropical infections like Falciparum malaria, leptospirosis, dengue haemorrhagic fever, typhoid fever, septicemic plague, Rickettsial infections, meningococcemia and other viral infections.[19]

DIAGNOSIS

- Clinical picture of CCHF is nonspecific thus; cannot be used by clinicians to support making early diagnosis. Early diagnosis is an essential requirement, not only for patient management but also for prevention of further transmission of disease, as it is a highly contagious disease.[4]

- CCHF virus infection can be diagnosed by several different laboratory test which include enzyme linked immunosorbent assay (ELISA), antigen detection, serum neutralisation, reverse transcriptase polymerase chain reaction (RT-PCR) and virus isolation.[3]

- The most definitive way of diagnosis is the demonstration of virus or viral genome.[4]

- Reverse-transcriptase PCR (RT PCR) is the method of choice for rapid laboratory diagnosis of CCHF virus infection.

- The ELISA test is considered the most sensitive and specific.[31] IgG and IgM antibodies may be detected in serum by ELISA from about six days of illness.[29] CCHF is confirmed either by detection of specific IgM antibodies or a four-fold increase of IgG titters.[1]

- Other laboratory investigations showed cytopenia, raised prothrombin time (PT) and activated partial thromboplastin time (aPTT), raised creatinine phosphokinase (CPK) and lactic dehydrogenase

(LDH) as well as altered liver and renal functions. Patients with above symptoms can rapidly progress to bleeding from multiple sites and death.[32] High serum ferritin levels have also been reported as indicator of severity of disease.[8]

Extreme biohazard risk is associated with testing of patient samples and conducted only under maximum biological containment situations.[3] The deadly virus requires biosafety level 4 containment.[33]

TREATMENT

Hospitalisation in special care unit with constant laboratory monitoring is cornerstone for treatment of CCHF. Till date there is no FDA approved drug or definitive treatment for CCHF.[21] Supportive care includes fluid management by IV crystalloids, oxygen, cardiac monitoring and administer blood and blood products as clinically indicated.[34] Care should include careful attention to fluid balance and correction of electrolyte abnormalities, oxygenation and hemodynamic support, and appropriate treatment of secondary infections.[35]

Ribavirin has been used for treatment for CCHF based mainly on *in vitro* sensitivity testing and efficacy studies in animals, but only a limited number of studies and/or anecdotal experience in humans.[36] Anecdotal experience from small CCHF cohort suggests a possible increase in survival with ribavirin administered within 72 hours after onset of illness. Use of oral ribavirin for treatment or post-exposure prophylaxis of CCHF is an off-label use of drug.

According to World Health Organization (WHO), ribavirin is the anti-viral medication used to treat CCHF and the recommended dose is an initial dose of 30mg/kg followed by 15mg/kg for four days and then 7.5mg/kg for six days for a total of 10 days.[4]

PREVENTION

Prevention and control of this infection require application of sophisticated epidemiologic and molecular biologic techniques, changes in human behaviour, a national policy on early detection of and rapid response to infection and plan of action.[7] Clingiroglu et al. stated lack of knowledge regarding CCHF in study population.[37]

1. High index of clinical suspicion:

- Agricultural workers and others working with animals should use insect repellent on exposed skin and clothing.
- Insect repellents containing DEET (N, N-diethyl-m-toluamide) are the most effective in warding off ticks.[38]
- Wearing gloves and other protective clothing is recommended.
- In endemic areas ticks should be eliminated from animals two weeks before they are slaughtered (e.g. with a pyrethroid acaricide).[39]
- Eating well cooked meat.[40]

2. Early laboratory diagnosis:

- CCHF must be included in differential diagnosis of unexplained fever with hemorrhagic manifestations especially in endemic region.[41]
- Development of strong laboratory capacity in areas where virus is expected to circulate.[6]
- Approaches for diagnostic methods should be standardised and the assays validated.
- Development of rapid diagnostic test.

3. Institution of containment measures curtailed further spread of disease.

- Use of personal protective equipment (PPE).[42]
- Strict barrier-nursing techniques should be enforced: all persons entering the patient's room should wear disposable gloves, gowns, masks, and shoe covers.[43]
- Protective eye wear should be worn by persons dealing with disoriented or uncooperative patients or performing procedures that might involve the patient's vomiting or bleeding.
- Accidental exposures need to be dealt promptly.[44]
- Contacts should be monitored for 14 days from date of last contact with the patient or other source of infection by taking temperature twice daily.[2]
- Administration of prophylactic therapy to healthcare workers after exposure.

4. Factors that trigger incidence and spreading of CCHF should be further identified.

5. Role of environment change should be further studied.

6. Development of new therapies and an effective and safe vaccine against CCHF.

7. Awareness of general public as well as health workers about the disease in all endemic regions should be increased.

- Launching general information campaign, inclusive advice to people visiting areas with CCHF risk.
- Broachers, posters and TV spots informing about the risk of CCHF infection should be distributed to educate people.

- Education programmes to be conducted door to door in endemic areas.

For a country size and population of India, CCHF remains a real and present danger. A meaningful response must approach the problem at system level.

PROPHYLAXIS PROTOCOL

Direct contact →Blood or secretions such as needle stick injury or contact with mucous membrane such as eye or mouth from confirmed CCHF patients →baseline blood studies and start high dose oral ribavirin therapy which constitutes:

- 2gm loading dose
- 4gm/day in 4 divided doses (6 months) for 4 days
- 2gm/day in 4 divided doses for 6 day

Indirect contact →Household or contacts who may have had same exposure to infected ticks or animals or who recall indirect contact with patients body fluids should be monitored for 14 days from last date of contact by taking temperature twice daily and if found 38.5 degree Celsius or higher, muscle pain and headache. Hospitalised and start high dose oral ribavirin therapy as mentioned above.

CONCLUSION

CCCHF is a disease of public health importance with a high fatality rate that had risen in incidence and displayed geographical spread over the past decade. The present scenario in India suggests the need to look seriously into various important aspects of this zoonotic disease, which includes identifying areas at risk, diagnosis, intervention, patient management, vaccine development, control of laboratory acquired and nosocomial infection, tick control, livestock survey and this, should be done in priority before it further spreads to other states.

A comprehensive national strategy on CCHF cutting across all relevant sectors with emphasis on strengthened surveillance, rapid response to protect valuable human lives, partnership building and research to guide public policy is needed.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Maltezou HC, Papa A.CCHF: Epidemiology trends and controversies on treatment. BMC Med. 2011;9:131:1-5.
2. Epidemic Investigation Cell Public Health Laboratories Division National Institute of Health, Islamabad. Guidelines for Crimean-Congo Haemorrhagic Fever (CCHF), 2008. Available at: http://floods2010.pakresponse.info/LinkClick.aspx?fileticket=mVs1K_dx1a0%3D&tabid=198&mid=1972. Accessed January 2008.
3. WHO. Crimean-Congo haemorrhagic fever, 2013. Available at: http://www.who.int/mediacentre/factsheets/fs208/en/. Accessed January 2013.
4. Appannanavar SB, Mishra B. An update on Crimean Congo haemorrhagic fever. J Glob Infect Dis. 2011 Jul-Sep;3(3):285-92.
5. Yilmaz GR, Buzgan T, Torunglu MA, Safran A, Irmak H, Com S et al. A preliminary report on CCHF in Turkey, March-June 2008. Ecosurveillance. 2008 July-Sep;13(7-9):1.
6. Yadav PD, Raut CG, Patil DY, Majumdar TD, Mourya DT. Crimean-Congo haemorrhagic fever: current scenario in India. Proceedings of the National Academy of Sciences, India. Biol Sci. 2014;84:9-18.
7. Dikid T, Jain SK, Sharma A, Kumar A, Narain JP. Emerging & re-emerging infections in India: an overview. Indian J Med Res. 2013 July;138:19-31.
8. Maurya TD, Yadav PD, Shete AM, Gaurav YK, Rawt CG, Jadi RS et al. Diagnosis, isolation and confirmation of CCHF in humans, Ticks and Animals in Ahmadabad, India, 2010-2011. PLos Neglect Trop Dis. 2012 May;6(5):1653.
9. Mourya DT. 6 from Guj test positive for Congo fever: NIV Times, 2013. Available at: http://punemirror.in/article/2/201307172013071711370759d55dd27e/6-from-Guj-test-positive-for-Congo-fever-NIV.html.
10. Indian Express. Congo fever kills 2 in Amreli village, 2013. Available at: http://archive.indianexpress.com/news/congo-fever-kills-2-in-amreli/1142367/.
11. Tropical Medical Bureau. 6 cases of Crimean-Congo haemorrhagic fever in Gujarat state of India, 2013. Available at: http://www.tmb.ie/destinations/news.asp?id=190955.
12. European centre for Disease, Prevention and Control. Consultation on CCHF prevention and control, 2008. http://ecdc.europa.eu/en/publications/Publications/0809_MER_Crimean_Congo_Haemorragic_Fever_Prevention_and_Control.pdf. Accessed 15 November 2011.
13. Whitehouse CA. Crimean Congo haemorrhagic fever. Antiviral Res. 2004;64:145-60.
14. Fabentech. Crimean-Congo hemorrhagic fever virus, 2011. Available at: http://www.fabentech.com/emerging_diseases/emerging-diseases/crimean-congo-hemorrhagic-fever-virus.
15. Deyde VM, Khristova ML, Rollin PE, Ksiazek TG, Nichol ST. CCHFV genomics and global diversity. J Virol. 2006 Sept;80(17):8834-42.
16. Izadi S, Naieni KH, Majdzadeh SR, Chinikar S, Nadim A, Rakhshar F et al. Seroprevelance of CCHF in Seston-va-Baluchestan Province of iran. Japan J Infect Dis. 2006;59:326-8.
17. Palomar AM, Portillo A, Santibanez P, Mazuelas D, Arizaga J, Crespo A et al. Crimean Congo haemorrhagic fever virus in tick from migratory birds, Morocco. Emerg Infect Dis. 2013 Feb;19(2):260-3.

18. Gear JHS. What is Congo-Crimean Haemorrhagic Fever? South Africa Med J. 1982 Oct;62:576-80.
19. Bajpai S, Nadkar MY. CCHF: requires vigilance and not panic. J Assoc Physicians India. 2011 Mar;59:164-6.
20. Naderi HR, Sheybani F, Bojdi A, Khosravi N, Mostafavi I. Fatal nosocomial spread of Crimean-Congo haemorrhagic fever with very short incubation period. Am J Trop Med Hyg. 2013 Mar;88(3):469-71.
21. Zavitsanou A, Babatsikou, Koutis C. CCHF: an emerging tick-borne disease. Health Sci J. 2009;3(1):10-5.
22. Centers for Disease Control and Prevention (CDC). Crimean Congo haemorrhagic fever, 2012. Available at: http://www.cdc.gov/vhf/crimean-congo/transmission/index.html.
23. Saijo M, Shimayi B, Han L, Zhang Y, Asiguma M, Tianshu D et al. Possible horizontal transmission of CCHFV from mother to her child. Japan J Infect Dis 2004;57:55-7.
24. Kara M. Global warming and parasites. Kafkas Univ Vet Fak Derg. 2012;18(A):245-8.
25. Center for Food Security and Public Health. Crimean Congo hemorrhagic fever, 2007. Available at: http://www.cfsph.iastate.edu/Factsheets/pdfs/crimean_congo_hemorrhagic_fever.pdf.
26. Centers for Disease Control and Prevention (CDC). Crimean Congo haemorrhagic fever, 2012. Available at: http://www.cdc.gov/vhf/crimean-congo/symptoms/index.html.
27. Ergonul O, Celikbas A, Dokuzoguz B, Eren S, Baykam N, Esener H. Characteristics of patients with Crimean-Congo haemorrhagic fever in a recent outbreak in turkey and impact of oral ribavirin therapy. Clin Infect Dis. 2004;39:284-7.
28. Schwarz TF, Nsanze H, Ameen AM. Clinical features of Crimean-Congo haemorrhagic fever in the United Arab Emirates. Infect. 1997;25:364-7.
29. Mardani M, Pourkaveh B. Crimean Congo haemorrhagic fever. Iran J Clin Infect Dis. 2012;7(1):35-40.
30. Karti SS, Odabasi Z, Korten V, Yilmaz M, Sonmez M, Caylan R et al. Crimean-Congo haemorrhagic fever in Turkey. Emerg Infect Dis. 2004;10:1379-84.
31. Public Health Agency Canada Crimean Congo haemorrhagic fever, 2001. Available at: http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/crim-congo-eng.php.
32. Patel AK, Patel KK, Mehta M, Parikh TM, Toshniwal H, Patel K. First Crimean Congo haemorrhagic fever outbreak in India. J Assoc Physicians India. 2011 Sept;5:585-89.
33. Science Daily. Tick by tick: Studying Crimean-Congo haemorrhagic fever virus carried by ticks, 2013. Available at: http://www.sciencedaily.com/releases/2013/08/130819171826.htm.
34. Director General of Health Services Ministry of Health and Family Welfare. Treatment protocol for Crimean Congo haemorrhagic fever, 2010. Available at: http://www.gujhealth.gov.in/Images/CCHFtreatmentProtocol.pdf.
35. Centers for Disease Control and Prevention (CDC). Crimean Congo haemorrhagic fever, 2012. Available at: http://www.cdc.gov/vhf/crimean-congo/treatment/index.html.
36. Rusnak JM. Experience with ribavirin for treatment and post-exposure prophylaxis of haemorrhagic fever viruses: Crimean Congo haemorrhagic fever virus, hanta virus and lassa virus. Appl Biosaf. 2011;16(2):67-81.
37. Clingiroglu N, Tenal F, Altintas H. Public's knowledge, opinions and behaviours about Crimean Congo haemorrhagic fever: an example from turkey. Kafkas Univ Vet Fak Derg. 2010;16(A):S17-22.
38. Centers for Disease Control and Prevention (CDC). Crimean Congo haemorrhagic fever, 2012. Available at: http://www.cdc.gov/vhf/crimean-congo/prevention/index.html.
39. Illustrated Lecture Notes on Tropical Medicine. Crimean Congo haemorrhagic fever, 2013. Available at: http://itg.content-e.eu/Generated/pubx/173/arboviruses/crimean-congo_haemorrhagic_fever.htm.
40. Medindia. Crimean Congo haemorrhagic fever, 2013. Available at: http://www.medindia.net/patients/patientinfo/congo-fever.htm.
41. Dunster L, Dunster M, Ofula V, Beti D, Vokampf KF, Burt F et al. First Documentation of Human Crimean Congo haemorrhagic fever, Kenya. Emerg Infect Dis. 2002 Sept;8(9):1005-6.
42. Gozel MG, Dokmetas I, Oztop AY, Engin A, Eladi N, Bakir M. Recommended precaution procedures from CCHFV. Int J Infect Dis. 2013 Nov;17(11):e1046-50.
43. Centers for Disease Control and Prevention (CDC). Management of patients with suspected viral haemorrhagic fever, 2012. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/00037085.htm.
44. Advisory Committee on Dangerous Pathogens. Management of hazardous group 4 viral haemorrhagic fevers and similar human infectious disease of high consequences, 2012. Available at: http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947382005.

DOI: 10.5455/2320-6012.ijrms20140504
Cite this article as: Agravat VJ, Agarwal S, Piparva KG. Crimean - Congo haemorrhagic fever: an overview. Int J Res Med Sci 2014;2:392-7.