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Crimean Congo Hemorrhagic Fever (CCHF): An Investigation Report, India, 2015

Abstract

Background: In India, first confirmed outbreak of Crimean Congo Hemorrhagic Fever (CCHF) was reported in 2011. Since then till now clusters of outbreaks were reported from various parts of Rajasthan. A team from National Centre for Disease Control, New Delhi, investigated the CCHF outbreak in Jodhpur, Rajasthan, and reporting here their result.

Methodology: A team conducted a CCHF outbreak investigation January 2015, with review of hospital records, discussion with hospital staffs and community members along with contact tracing. Environmental examination, collection of human and animal serum sample, collection of tick sample and entomological survey was also carried out.

Results: Four laboratories confirmed CCHF cases reported among male nurses working in the ICU of a private Hospital. Two expired and other two cases took treatment from private hospitals and have now recovered and are healthy. As per records, one case admitted in ICU was suspected as with possible symptoms of CCHF. Seventy-five percent of confirmed cases did not follow proper biosafety precautions. The blood and ticks' samples of domestic animals were found to be negative for CCHF. Overall CFR in this outbreak was 50%.

Conclusion: CCHF outbreak was propagated nosocomially due to poor infection control practice and low index of suspicion for CCHF amongst treating physicians.

Keywords: CCHF, Comprehensive, Outbreak, Investigation, Rajasthan, Infection Control.

Background

Crimean-Congo hemorrhagic fever virus (CCHFV) is an emerging tick-borne virus of the *Bunyaviridae* family that is responsible for a fatal human disease. The geographic range of CCHFV is exceptionally wide and reflects the broad distribution of the tick vector, which extends throughout 30 countries within Africa, Asia, the Middle-East, and Southern Europe.¹ Recent outbreaks of CCHFV infection in several Balkan states, southwestern Russia, and Turkey suggest that the activity of CCHFV is increasing, particularly in Southern Europe.² A significant number of cases were also reported from Middle-Eastern countries such as Iraq, the United Arab Emirates (UAE), and Saudi Arabia. In the previous decade, most cases have been reported from Pakistan, Iran, Bulgaria, Turkey, and India. So CCHF is endemic in Asia, parts of Africa, Europe and Russia.³

CCHF outbreaks constitute a threat to public health services because of its epidemic potential, its high case fatality ratio (10-40%).⁴ It is potential for nosocomial (hospital-acquired infection) outbreaks.⁵

In SEAR, the first laboratory confirmed case was reported on 19 January, 2011 in Gujarat state, India.⁶ Since then, there are many clusters of cases and isolated cases; outbreaks were reported from various parts of Gujarat, Rajasthan and Uttar Pradesh.⁷

The details of various outbreaks occurred in various part of India are given in Table 1.

Table 1.CCHF Outbreak Reported from Various Parts of India

S. No.	Place	Year	No. of Cases	No. of Deaths	Type of Outbreak	Case Fatality Rate
1	Gujarat (Sanand)	2011	6	4	Cluster	75%
2	Gujarat	2012	1	1	Isolated	100%
3	Gujarat (Kutch)	2012	1	1	Isolated	100%
4	Gujarat (Sanand)	2013	2	2	Cluster	100%
5	Gujarat (Amreli)	2013	18	7	Cluster	38.8%
6	Gujarat (Patan)	2013	1	1	Isolated	100%
7	Gujarat (Bhuj)	2014	3	3	Cluster	100%
8	Rajasthan (Sirohi)	2014	1	0	Isolated	0
9	Rajasthan (Jodhpur)	2015	4	2	Cluster	50%
10	UP (Moradabad)	2015	1	1	Isolated	100%
11	Gujarat (Kutch)	2015	1	0	Isolated	0

The present scenario in India suggests the need to look seriously into various important aspects of this zoonotic disease, which includes diagnosis, intervention, patient management, control of laboratory-acquired and nosocomial infection, tick control, livestock survey and this should be done on priority before it further spreads to other states.⁸

The aim of this article is to present the report of CCHF outbreak investigations conducted by a multi-disciplinary central team comprising of epidemiologists, entomologists and veterinary physicians in Jodhpur, Rajasthan, in January, 2015. It will help in creating awareness among public health stakeholders for early control and taking preventive measures for timely diagnosis and management of CCHF cases and for containing the spread of infection. The objective of this outbreak investigation was to study the extent of CCHF outbreak and find the associated risk factors for this outbreak and to recommend measures for preventing such occurrences of outbreak in future.

Methodology

Central team visited Jaipur and Jodhpur from 22nd to 29th January 2015 to investigate outbreak of Crimean Congo hemorrhagic fever. During the visit, team had taken the steps to investigate outbreak like interview/discussion with state and district health officials, interview/discussion with clinicians, microbiologist/pathologists and other staff members of private and government hospitals, discussion with community members, review of hospital records and case sheets, environmental examination, collection of human, animal serum and tick sample and entomological survey. In this outbreak investigation, total around ten interviews were undertaken and around five facilities were visited to complete the report. These are the

following interviews: 1. With Sate Health Authority; 2. District Health Authority; 3. Interview with clinician of concerned hospital; 4. Interview with microbiologist/pathologist of concerned hospital; 5. Interview with all concerned doctors of all major private hospitals of that district; 6. Community members of Jodhpur district; 7. Community members of Jodhpur district; 8. Health staff of ESI hospital; 9. Animal Husbandry Department; and 10 interviews with community health workers.

In this outbreak investigation, total 50 human samples (out of total 284 populations) were collected and tested; out of all, 6 (six) human samples were positive for CCHF virus. Again 44 animal blood samples, i.e., 24 from cattle 10 each from sheep and goats and 352 live ticks were collected mainly from cattle, sheep, goat and camel. The sera and ticks sample were sent to National Institute of High Security Animal Diseases, Bhopal, for testing.

Results and Observations

As per the information, total four cases of CCHF as laboratory confirmed by National Institute of Virology, Pune occurred among male nurses from a private hospital, Rajasthan.

On detailed investigation, it was found that dates of onset of all four cases were in one or two days span. Out of these four CCHF cases, two cases had expired; the other two cases took treatment, recovered and were healthy. These details are provided in Table 2. The team studied detailed case history of all those admitted cases of ICU of the private hospital where all these four male nurses were working, since last fourteen days from the day of first case developed symptoms, as 14 days is the maximum incubation period for CCHF virus infection.

Table 2. Details of Laboratory Confirmed CCHF Cases in Rajasthan

S. No.	Names of Patients	Age/ Sex	Date of Onset	Date of Admission	Symptoms	Remarks
1	Case 1	30/ M	13/01/2015	14/1/2015	Fever with chills, myalgia and hemoptysis	Died on 20 th January, 2015
2	Case 2	21/ M	13/01/2015	15/1/2015	Fever with chills, myalgia and vomiting	Died on 18 th January, 2015
3	Case 3	24/ M	14/1/2015	18/01/2015	Fever	Recovered and healthy
4	Case 4	25/ M	14/01/2015	21/01/2015	Headache, vomiting and Fever	Recovered and healthy

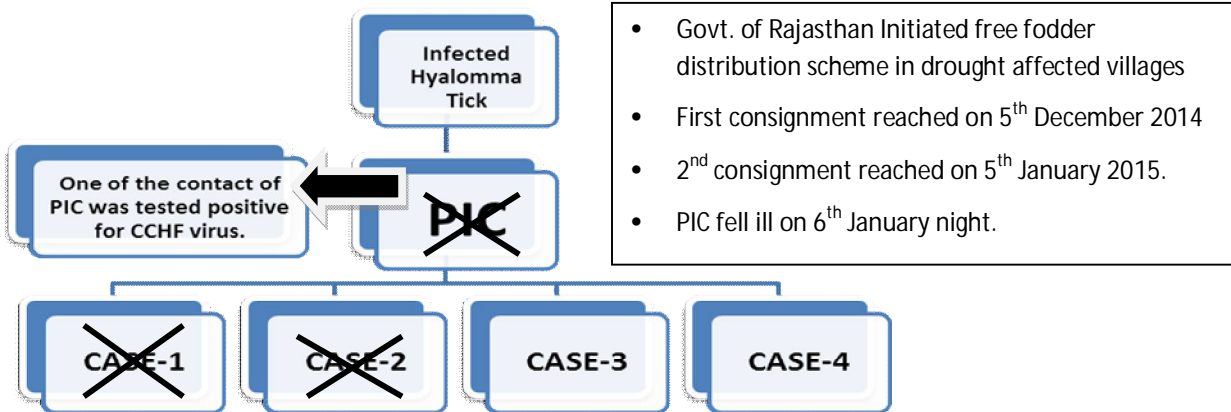


Figure 1. Presenting the Transmission of CCHF Infection among Hospital Staff

These are the following cases were admitted in ICU of that hospital during the stay of index case in hospital: respiratory illnesses (11), road traffic accidents cases (9), cardiovascular diseases (2), diabetic keto-acidosis (1), seizure disorder (1), viral Hepatitis and UGI bleeding (1), acute renal failure (1) and H1N1 (1). After considering all the fine points of all those ICU cases, by exclusion method on the basis of diagnosis, signs and symptoms and clinic-epidemiology findings, the team came to winding up conclusion that one case suspected as viral hepatitis who died in ICU in that period, may be suspected as the probable index case (PIC) of this outbreak. However, on detailed clinical review by the senior clinician, this case was found to be compatible with probable case of CCHF.

Possible index case was a middle-aged man of 42 years, *Charwaha* by occupation and with additional responsibility of distribution of fodder under free fodder scheme of the state government. The free fodder consignment arrived in his village one day before of his day of onset of illness. Then PIC started suffering from high-grade fever, body ache agitation, diarrhea, swelling around the eyes upper GI bleeding, hematuria, which continued for 4-5 days and he expired on the fifth day. During the hospital stay, PIC was investigated for HIV, HbsAg, HCV, HAV, HEV, malarial parasites and dengue. But report was negative for all laboratory investigations

whereas on ultrasonography, it was reported mild hepatomegaly with mild right pleural effusion. CT scan of brain report was also normal. To further investigate, the central team visited the village of PIC which was located on an isolated locality of Pokhran block with total population of 284 (total 48 households). Main earning source of this community was from domestic livestock. Most of the residents were involved in farming for a limited period during rainy season.

The PIC family was Hindu by religion, comprising ten members and belonging to above-poverty line. Adult members always ensured hand hygiene before taking food but use of soap or detergent was absent. Children were not following strictly hand washing practices, even after animal handling. The team could not find other cases of similar illnesses in the village and also there was no history such as illnesses reported in the village during the last six months.

The area was vulnerable to occurrence of CCHF as the soil and climatic conditions were suitable for multiplication of ticks and other parasites on body surface of animals. Domestic animals of that village were kept in a common place in separate enclosures at outskirts of the village. There was a place for distribution of free fodder near this enclosure. There were no demarcated pathways inside the village because soil is

sandy throughout the village. Dry animal dung was found to be scattered on sandy soil throughout the village especially near animal enclosures.

Further information was collected about the epidemiological linkage between PIC and four laboratory-confirmed cases. It was confirmed from duty roster of ICU private hospital that out of four cases, three confirmed cases attended this PIC in ICU during their hospital stay. Possibility of fourth confirmed case also attended to PIC could not be ruled out as he was a good friend of other three cases and duty schedule was not very strictly followed in that private hospital.

Discussion

On analysis of case sheet of all the cases admitted in ICU within fifteen days duration before onset of first case, it was revealed that there was only one case with compatible clinical symptoms of CCHF. Three out of the four laboratory-confirmed cases attended to this patient. Possibility of fourth case also came in contact with this case during that period cannot be ruled out as duty roster was not being very strictly followed in that hospital. The various sequences of events are further described in Fig. 2.

5 th January, 2015	•Consignment of free fodder vehicle reached in Village
6 th January, 2015	•PIC developed fever
7 th January, 2015	•Took treatment from Government Hospital but condition was deteriorated
8 th January, 2015	•Still complaining of fever, agitation, diarrhoea, swelling around the eyes and upper GI bleeding and shifted to Private Hospital
9 th January, 2015	•Condition further deteriorated
10 th January, 2015	•The patient was expired
13 th January, 2015	•Two nursing staff, who attended PIC at ICU, was developed symptoms
14 th January, 2015	•1st case got admission at ESI hospital. Again 3rd & 4th case also developed Symptoms on same day
15 th January, 2015	•2nd case got admission
18 th January, 2015	•1st case died
19 th January, 2015	•2nd case shifted to AIIMS, Delhi
20 th January, 2015	•2nd case died in AIIMS Hospital.
22 nd January, 2015	•As per order by Director, NCDC, A Team reached Jaipur to investigate CCHF Outbreak •Report was positive for CCHF virus for 1st and 2nd case by NIV Pune
22 nd to 27 th January, 2015	•Central Team investigated the outbreak, Preventive and control measure started and no further case reported

Figure 2. Sequences of Events in this CCHF Outbreak in Jodhpur, Rajasthan

Few epidemiological clinical facts and other observations were strengthening the possibility of this case to be an index case. As PIC was a *charwaha* by occupation, he spent most of his time with the cattle and was also employed as distributor of free fodder for animal, which may be leading to increasing possibility of exposure to animal ticks.

The patient was healthy before the onset of current illness and there were no others significant illnesses reported in the case. The team could not find other cases of similar illnesses in the village, so it was a secluded outbreak. Clinicians at the hospital suspected him as a case of viral hepatitis. On laboratory examination, patient was found to be negative for hepatitis A, B and C. Later, the clinicians also supported the possibility of this case, a case of CCHF.

The cattle in the village of this case were found to be heavily infested with ticks and also the environmental condition in the village was highly conducive for multiplication of ticks. Further, the study entitled Cross Sectional Survey of CCHF Virus and IgG Antibody in Domestic Animal in India concluded that there is 10.5% positivity of cattle samples in Rajasthan where this district is located.⁹

First CCHF outbreak in India was reported from Gujarat, where a total of 13 case patients of CCHF were identified out of which 9 were positive for CCHF virus, 2 were negative for CCHF virus and in 2 instances, samples could not be taken because of early deaths of the cases. Among these 13 cases, 30.76% mortality rate was noted.⁸ In this outbreak, there were a total of four laboratory-confirmed cases and case fatality rate was 50%, which also supported the evidence provided by WHO in Global Alert & Response: CCHF.⁴

As in this outbreak all the cases were young adults, same was observed in the first outbreak in India. Presence of ticks' exposure was the most prevalent risk factors for getting CCHF virus infection. The same findings were reported by Gandhi et al. in their outbreak investigation report in Gujarat.⁸

Again in one of the studies from Turkey by Gozalan reported that tick exposure was the most common risk factor (74.2%).⁸ Hasan mentioned in his outbreak report that early diagnosis of CCHF enables rapid engagement of appropriate isolation, barrier nursing and infection control measures help in preventing nosocomial transmission of the virus.¹⁰ Same measures were taken by the central team to control the CCHF outbreak in Rajasthan in 2015.

Action Taken

1. Daily reporting/ nil reporting of suspect/ probable/ confirmed CCHF cases for two weeks (as per case definition) by all government and private hospitals.
2. Monitoring of all contacts twice daily for clinical symptoms for 14 days from the day of last exposure with the patient or other sources of infection.
3. Setting up of separate isolation wards for suspect/ probable/ confirmed CCHF cases in government hospitals.
4. Sensitization and distribution of CD alert on CCHF to representatives of all major private hospitals.
5. IEC to improve personal hygiene and sanitary conditions in the village.
6. Tick control measures were also undertaken (by using Cypermethrine (3.4 mL/L of water)

Conclusions and Recommendations

Universal infection prevention and control practices should be strictly adhered to in all healthcare facilities dealing with suspected, probable and confirmed cases. Need to improved surveillance of acute hemorrhagic fever. Sero-surveillance for CCHF among domestic animals is very essential. IEC activities related to causation, transmission and prevention including protection from tick bites and safe handling of dead bodies should be carried out.

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Conflict of Interest: None

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