

Full Length Research Paper

Nosocomial outbreak of Crimean-Congo hemorrhagic fever in Holy Family Hospital, Rawalpindi, Pakistan, 2010

Jawad A. Mofleh^{1*}, Rana J. Asghar², R. S. Kakar³, S. Z. Zaidi⁴ and B. M. Kazi⁵

¹Eastern Mediterranean Public Health Network.

²Field Epidemiology and Laboratory Training Program, Pakistan.

³World Health Organisation (WHO), Pakistan.

⁴Department of Virology, National Institute of Health, NIH Laboratories, Islamabad, Pakistan.

⁵National Institute of Health, National Park road, Chak Shehzad, P. O. Box 1013, Islamabad, Pakistan.

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On 14 September, 2010, a suspected case of Crimean-Congo Hemorrhagic Fever (CCHF) was admitted in Holy Family Hospital (HFH). The case was confirmed on 20 September, 2010. The hospital had experienced loss of one intern due to CCHF in 2000s, a panic was created and the blood specimens of team taking care of index case (IC) was sent to reference laboratory for examination. On 28th September, all specimens announced positive for CCHF. A retrospective study was conducted to detect all cases and contacts of the IC. Line list of cases and contacts were built. We interviewed cases, contacts and relevant staff of the hospitals. Out of 19 suspected cases admitted in HFH on the 14th September to 4th November 2010, 11 were positive for CCHF. Nine of the 11 cases were hospital acquired infections (HAI). All the cases with HAI are exposed to IC. Four of the 11 cases had fever only and 2 of the 11 cases had fever with hemorrhagic signs and symptoms. Hemorrhagic cases were IC and another case who had fever, melena and hematuria. Five HAIs did not report any sign and symptom. Seven of the 9 HAI cases were treated with ribavirin. All cases were confirmed by polymerase chain reaction (PCR). None of their family contacts developed the disease. A nosocomial outbreak of CCHF involving 4 medical doctors, 3 nurses, 1 student of nursing school and 1 ward boy was investigated in HFH. IC and HAI cases survived. Poor infection prevention measures in the hospital were associated with the outbreak.

Key words: Nosocomial infection of Crimean-Congo hemorrhagic fever (CCHF), hospital based outbreak of CCHF, Crimean-Congo hemorrhagic fever, infection prevention hospitals, Pakistan.

INTRODUCTION

Crimean-Congo hemorrhagic fever (CCHF) is a severe vector borne viral hemorrhagic fever. Virus and its vector are widely distributed to the different parts of the world, which include Africa, Asia, Middle East and Eastern Europe (Chinikar et al., 2010). The virus which is causing the disease belongs to the genus *Nairovirus* in the

Bunyaviridae family. The virus is prevalent in animals and causes cases and outbreaks of CCHF in humans. CCHF infects a wide range of domestic and wild animals (Gonzalez JP, 1990; Morrill et al., 1990; Mir et al., 2011). The vehicle which transmits the disease from animal to human is Hyalomma ticks or the virus is transmitted by

*Corresponding author. E-mail: jmofleh@yahoo.com. Tel: +962775700325.

direct contact with the blood or tissues of infected humans or viraemic livestock (Wölfel et al., 2007).

Nosocomial transmission of the infection is frequently reported (Athar et al., 2005; Pierre et al., 2004). CCHF is mainly a rural disease; poverty and poor medical care services facilitate transmission of this disease (Boon NA, 2006). War, social unrest and lack of vector control programs are other factors that can trigger outbreaks of the disease.

CCHF has an incubation period of 2 to 9 days (Swanepoel et al., 1989). The disease has a wide range of hemorrhagic symptoms from rash to excessive bleedings from different body organs. Fever is constantly elevated from 5 to 12 days or may be biphasic. It is estimated that five infections occur for each hemorrhagic case, in Russia (Heymann, 2008). Case fatality rate is around 30% (range: 2 to 70%) (Kuljić-Kapulica, 2004; Ergönül, 2006). Most fatalities occur within 5 to 14 days after onset of the disease (Heymann, 2008). CCHF does not have a specific treatment except for providing supportive care (Papadakis, 2009). Early diagnosis of CCHF is important for case management and protection of medical staff. Convalescence is prolonged (Kuljić-Kapulica, 2004).

Nosocomial outbreaks of the disease have been reported in recent years in Pakistan, Iraq, Dubai, South Africa (Athar et al., 2005) and Mauritania (Pierre et al., 2004). Poor universal infection control measures are one of the main cause of nosocomial transmission of disease among health care workers (Mardani et al., 2009).

The first case of CCHF was reported in Rawalpindi, Pakistan in 1976 (Athar et al., 2003; Pirkani and Jogezi, 2007). Nosocomial infections of CCHF have been recorded in Pakistan in 1976 (Burney et al., 1980), 1987 (Pirkani et al., 2006), 1994 (Altaf et al., 1998), 2000 (Khabir A, 2000; IRIN, 2000), and 2002 (Athar et al., 2003; Khabir A, 2000).

The disease is more prevalent in Baluchistan (South east) province of Pakistan (Pirkani et al., 2006), but the disease is spreading toward the south and west of the country. CCHF in Pakistan has a bi-annual surge, the first peak is between March and May and the second peak is between August and October (Azeem et al., 2005).

On the 28th of September, 2010, Holy Family Hospital (HFH) were informed that health care providers who took care of a CCHF patient nearly two weeks earlier tested positive of CCHF. An outbreak investigation was launched to investigate the outbreak and recommend control measures.

METHODOLOGY

A retrospective investigation was conducted from 13th October to 4th November 2010. All patients who tested positive for CCHF infection at HFH from 14th September to 4th November, 2010 were included in the study.

Based on the hospital medical record and logbook of laboratories of National Medical Institute (NID), a comprehensive line list of cases

were developed. All suspected, probable and confirmed cases admitted to the HFH were included in the study. Interviews with patients and their families were conducted. All contacts were listed and interviewed.

Pakistan's Disease Early Warning System's case definitions were used for this outbreak investigation. Case definitions were (National Institute of Health, 2009; 2010):

1) Suspected case: A suspect case was defined as any patient with sudden onset of illness with high-grade fever over 38.5°C for more than 72 h and less than 10 days, especially in CCHF endemic areas and among those in contact with sheep or other livestock (shepherds, butchers, and animal handlers).

2) Probable case: A probable case was defined as a patient with acute history of febrile illness 10 days or less, and thrombocytopenia less than 50,000/mm³, and any two of the following: petechial or purpuric rash, epistaxis, hematemesis, hemoptysis, blood in stools, ecchymosis, gum bleeding, or other hemorrhagic symptoms and unknown predisposing host factors for hemorrhagic manifestations.

3) Confirmed case: Probable case with positive diagnosis of CCHF in blood sample, performed in specially equipped high bio-safety level laboratories, such as: confirmation of the presence of immunoglobulin G (IgG) or IgM antibodies in serum by enzyme-linked immunosorbent assay (ELISA); detection of viral nucleic acid in specimen by polymerase chain reaction (PCR); isolation of virus; HFH (working) outbreak case definition; a suspected, probable or confirmed case of CCHF that visited HFH from 1st September to 14th October, 2010; any health care provider who provided any direct care to any CCHF patients from 1st to 14th October, 2010 and wanted to be tested for CCHF.

National Institute of Health (NIH) laboratories tested all blood specimens by real time-polymerase chain reaction (RT-PCR). ELISA tests were not used on the specimens.

RESULTS

Nineteen persons met the outbreak case definition. Out of nineteen cases, one was the index case (IC) who was admitted in the hospital on the 14th of September and she was in the hospital till 16th of September, 2010.

The IC was a 35 years old woman from Toot area of Attock district, a rural district of Punjab province. Blood specimen of IC was collected upon admission and sent to NIH laboratories for confirmation. On 16th of September, a relative of the patient took her to another private tertiary hospital in Islamabad, where she was admitted in an isolation ward. On the 20th of September, the result of blood specimen was announced to be positive for CCHF. IC was treated in Shifa International Hospital and discharged on the 29th of September after recovery. IC did not report any tick bite or exposure to blood or body fluids of human or animals, but she was a resident of Attock, a rural area with frequent contacts with the animals. Family members of the IC reported that they keep small ruminants in the house. An infection control nurse reported that she found a tick from corridor of the IC room in the hospital.

During 14 to 16th September, at the time that IC was in HFH, nine health care workers took care of the IC. The composition of medical team members were as follows: four medical doctors, three nurses, one student nurse and

Table 1. Linelist of CCHF cases in HFH, 2010 Pakistan.

S/No.	Age (year)	sex	Profession	Sign and symptoms	Date of Admission	Specimen collection date	Lab result	Classification	Date of lab result announcement	Treatment with Ribavirin	Date of discharge
1	35	Female	Housewife	Fever, Melena, Hematuria	14-Sep-10	14-Sep	Positive	Confirmed case/ Index case	20-Sep	Yes	Shifted to Shifa Hospital 16/09/2010- Discharged alive
2	19	Male	Student	Fever, Hematemesis, Melena	17-Sep-12	17-Sep	Positive	Confirmed case	20-Sep	Yes	Died
3	24	Female	Nurse	NA	NA	21-Sep	Positive	Confirmed case	28-Sep	Yes	Discharged
4	26	Male	Nurse	Fever	29-Sep-10	21-Sep	Positive	Confirmed case	28-Sep	Yes	Discharged
5	26	Female	Doctor	Fever	NA	21-Sep	Positive	Confirmed case	28-Sep	Yes	Discharged
6	27	Female	Doctor	NA	NA	21-Sep	Positive	Confirmed case	28-Sep	Yes	Discharged
7	23	Female	Doctor	NA	NA	21-Sep	Positive	Confirmed case	28-Sep	No	Discharged
8	16	Female	Student Nurse	Fever	29-Sep-10	21-Sep	Positive	Confirmed case	28-Sep	Yes	Discharged
9	26	Female	Doctor	NA	NA	21-Sep	Positive	Confirmed case	28-Sep	Yes	Discharged
10	23	Male	Ward Boy	Fever	NA	21-Sep	Positive	Confirmed case	28-Sep	Yes	Discharged
11	25	Female	Nurse	NA	NA	22-Sep	Positive	Confirmed case	29-Sep	Yes	Discharged

one ward boy; on the 20th of September another suspected case was admitted in the HFH.

Nineteen suspected cases were tested for CCHF, eleven were positive for CCHF. Out of eleven positive cases, one was the IC, nine were the medical team who took care of the IC and one was a 19 year old boy who was admitted to the hospital three days after admission of IC.

Age range of eleven confirmed cases were 16 to 35 years with a mean of 24.5 years. Eight were female. Four out of eleven cases only reported fever and two out of eleven cases reported fever with hemorrhagic signs and symptoms. Five health care workers did not report any sign and symptom at all. All eleven cases were healthy individuals before their sickness and they did not report and recall CCHF for themselves and/or in their families (Table 1).

All specimens were tested from 14 to 28th of September, 2010. As per laboratory confirmation, primary attack rate of CCHF among health care workers were 100%. However, none of them

reported hemorrhagic signs and symptoms. Eight out of nine cases did not report any exposure with blood or body fluids of the patients, animals and tick bite. Only one nurse reported minimum contamination of her gloves with the blood of the IC.

Ten out of eleven HFH cases were treated with ribavirin. One hemolytic anemia due to ribavirin was reported. Ten out of eleven cases survived; the one death was a 19 year old boy who was admitted in the hospital three days after the IC and died of complications of the disease a day after admission. Another team took care of this patient and the first team was not responsible to take care of the 19 years old boy.

In interviews, seven out of eight members of the medical team in HFH admitted that infection control and prevention measures were not adequate at the time of admission of IC. The IC was admitted in a regular room. None of the team members had enough protective equipment, such as N95 mask, and only two medical doctors and one nurse had gloves on while examining the patient

or other medical procedures.

A contact investigation was conducted. Three types of contacts identified which include team mates, family and hospital staff. One hundred and eleven contacts were identified which include thirty three family contacts, seventy eight workplace and medical contacts. The investigation team interviewed ten family contacts and fifteen workplace and medical team contacts. One person per family (mainly head of households), all team mates and only those workplace contacts that consented were interviewed. No sign and symptom of disease was reported by workplace contacts, roommates, or family members of the confirmed cases. One nursing student, who was the roommate of a patient, reported fever in the last two weeks; this individual tested negative for CCHF. Contacts without signs and symptoms were not laboratory tested due to budgetary constraints and lack of resources. All the cases were confirmed by RT-PCR using the standard protocols (Schwarz et al., 1996) and ELISA test

was not used.

DISCUSSION

Nosocomial cases of CCHF are not uncommon. Hospital acquired infection and outbreaks of disease are reported in different countries including Iran (Naderi HR, 2011), Pakistan, Dubai (Suleiman et al., 1980), South Africa (van Eeden et al., 1985) and Mauritania (Pierre et al., 2004). Health care workers are a major risk group of the disease all over the world and almost all the time they contract the disease from the patients (Yunus et al., 2009). We reported a nosocomial outbreak of CCHF which involved nine health care workers recorded in the HFH in Rawalpindi, Pakistan. A team of the health care workers who took care of one suspect case of CCHF from 14 to 16th of September, 2010 contracted the disease. Health care workers manifested mild cases of CCHF and none of them reported hemorrhagic signs and symptoms of the disease. This is not the first time that cases of mild CCHF is reported, mild cases were also reported in South Africa (van Eeden et al., 1985) and Turkey (Ergönül 2004). Result of contact tracing confirmed that no tertiary cases developed.

A second case of CCHF also admitted in the hospital three days after the admission of the first case, due to implementation of strong infection control procedures, no secondary case was reported from the hospital.

Mild cases of CCHF secondary cases who contracted the disease from the IC, seems that transmission and passage of the virus from human to human reduce the virulence of the virus. More studies are required to confirm this finding.

Conclusion

CCHF has been recognized as being endemic in Pakistan since 1970s, and since 2000, the number of cases are rising (National Institute of Health, 2010). Health care workers are classified as being at high risk of this disease (Ergonol, 2007) and this is well documented in the literature. Nosocomial infections have been recorded in Pakistan in 1976 (Burney et al., 1980), 1987 (Pirkani et al. 2006), 2000 (Khabir, 2000), 2002 (Athar et al., 2003) and 2010. This is not the first time that nosocomial cases of CCHF occurred in HFH-Rawalpindi among health care workers. In February 2002 after admission of a CCHF case, two interns contracted the disease which resulted to death of a female intern (Athar et al., 2005; Athar et al., 2003).

Almost all victims of nosocomial infections were health care workers. Inadequate standards of the infection prevention and control measures in the hospital were associated with the outbreak.

Poor infection control measures in the hospitals increase the chances of health care workers to contract

the infection (Mardani et al., 2009). Therefore, heedful implementation of standard and universal infection control measures can prevent outbreak of diseases in health care setting.

Whilst usually the disease has a high mortality and severe morbidities, it is recommended to ensure availability of proper surveillance systems to detect suspected cases and diagnostic facilities were appropriate and possible. Early detection and diagnosis of the cases increase the chance of the survival of the patients and protect health care workers from infections.

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