CRIMEAN-CONGO HEMORRHAGIC FEVER OUTBREAK IN RAWALPINDI, PAKISTAN, FEBRUARY 2002: CONTACT TRACING AND RISK ASSESSMENT

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Abstract. A 25-year-old woman, later identified as index case of Crimean-Congo hemorrhagic fever (CCHF), presented to Holy Family Hospital in Rawalpindi, Pakistan with fever and generalized coagulopathy. A retrospective contact tracing was conducted to explore the modes of exposure possibly associated with transmission of CCHF infection among contacts. We traced 32 contacts of the index case and 158 contacts of secondary cases and tested them for IgG and IgM antibodies against CCHF virus by an enzyme-linked immunosorbent assay technique. According to the type of exposure, contacts were divided into five subsets: percutaneous contact with blood, blood contact to unbroken skin, cutaneous contact to non-sanguineous body fluids, physical contact with patients without body fluids contact, and close proximity without touching. Two out of four contacts who reported percutaneous exposure tested positive for antibodies to CCHF virus. We conclude that simple barrier methods and care in provision of CCHF cases may prevent transmission of this infection.

INTRODUCTION

Crimean-Congo hemorrhagic fever (CCHF) virus is known to be transmitted by Hyalomma ticks. The first case of CCHF was described in the former Soviet Union in 1944. Since then outbreaks have been reported from the USSR, Bulgaria, Saudi Arabia, the United Arab Emirates, Kuwait, Pakistan, and Iraq. Crimean-Congo hemorrhagic fever is endemic in Pakistan. The first case in this country occurred in 1976. Nosocomial outbreaks have been reported in recent years in Pakistan, Iraq, Dubai, and South Africa. Mortality is reported to be high (from 15% to 100%). It has been shown that the duration of contact determines the transmissibility of CCHF virus among humans; however, epidemiologic studies also indicate that infection is not readily transmitted via the aerial route.

We conducted a retrospective contact tracing to explore modes of exposure possibly associated with transmission of CCHF virus infection among contacts.

CASE SUMMARY

A 25-year-old woman was referred to Holy Family Hospital in Rawalpindi, Pakistan with a one-week history of high-grade fever, rigors, myalgias, and generalized coagulopathy. Laboratory studies were consistent with disseminated intravascular coagulation (DIC). The patient identified as the index case of CCHF died 36 hours after presentation. No serum sample was saved for retrospective diagnosis because there was no suspicion of CCHF virus infection.

Five days after the death of the index case, one of the female interns involved in her care developed fever, chills, vomiting, and abdominal pain. A coagulation profile, the results of which was initially normal, showed marked deterioration on day 4 of the illness, consistent with DIC. Unfortunately, the intern died on day 8 of her illness. Antibodies (IgM and IgG) were detected in the serum sample taken on day 6 by an enzyme-linked immunosorbent assay (ELISA) technique. Virus was also isolated from the same serum sample by a reverse transcriptase-polymerase chain reaction (RT-PCR) assay.

A male intern also managed the index case. He developed flu-like symptoms four days after contact, followed by high-grade fever (101.6°F), epistaxis, and several episodes of gum bleeds. Suspecting CCHF, anti-viral therapy with oral ribavirin was prescribed and the patient was effectively isolated at home. Diagnosis of CCHF was later confirmed by ELISA.

The exposed included the secondary cases, the families of all three cases, and all health care workers (HCWs) coming in contact with the index and secondary cases. The number of contacts was high (n = 190). To explore the possible modes of CCHF transmission, contacts were divided into five categories: A) percutaneous contact with blood (needle pricks, blood contact to broken skin/mucosa), B) blood contact to unbroken skin, C) cutaneous contact to non-sanguineous body fluids (e.g., saliva, sweat, vomitus, urine, and feaces), D) physical contact with patients without body fluids contact, and E) close proximity to the patient without touching (Table 1).

Samples were collected from the high-risk contacts (category A, B, and C) and were tested with anti-human immunoglobulin antibodies for the presence of IgG and IgM antibodies against CCHF virus by ELISA. The diagnosis was confirmed by isolating the virus using an RT-PCR assay.

RESULTS

Contact investigation of the index case. Eight relatives of the index case reported contact with blood and extensive physical contact with the patient (category B). None of them developed any symptom(s) or signs of CCHF. Their serum samples were all negative for antibodies against CCHF virus. Twelve HCWs provided care to the index case. Secondary case 1 had appreciable contact with the respiratory secretions and blood of the index case while changing intravenous infusions and performing gastric lavage. Later, she also gave mouth-to-mouth respiration to the index case. She may have acquired the virus either by blood spilling on her hand or by respiratory secretions coming in contact with her eyes or buccal mucosa. Because of the nature of her contact she was placed in category A.

Secondary case 2 reported appreciable exposure to respi-
Evidence ruled out airborne transmission. In our experience, none of the contacts developed the disease after sharing the same environment as the index or the secondary cases. Of the 190 listed contacts, 2 (1.05%) developed the disease; both were the contacts of index case.

Percutaneous exposure remained the highest risk of transmission. An attack rate of 50% was seen in contacts that had a percutaneous or equivalent exposure (category A) (Table 2). However, due to the fact that the number of contacts who had category A exposure was small (four), we recommend interpreting these findings with caution. The percutaneous exposure that occurred from the index case to secondary case 1 was either in the form of saliva or respiratory secretions coming in contact with buccal mucosa or blood contact with broken skin not evident by the naked eye. The risk of cutaneous transmission through unnoticed skin breach necessitates cautious handling of blood and blood products. The male intern noted appreciable contact of respiratory secretions of index case with his eyes and face. Recommendations demand use of face shields or surgical masks, and wearing eye protection by persons coming within approximately three feet of the patient to prevent contact with blood, other body fluids, secretions, or excretions.

We conclude that the health care professional caring for CCHF patients should take all possible safety measures to avoid contact with blood or secretions, and simple barrier nursing effectively prevents the disease, as has been seen in Lassa fever cases. It also appears that CCHF is not spread by air. However, further studies are needed to elaborate the specific routes of transmission of the disease.

Experts from developed countries recommend expensive approach such as high-efficiency particulate air respirators for HCWs caring for the CCHF patients and negative pressure isolation rooms. Such approaches are costly and not feasible for a third-world country such as Pakistan.

TABLE 1

<table>
<thead>
<tr>
<th>Categories</th>
<th>Index case</th>
<th>Secondary case 1</th>
<th>Secondary case 2</th>
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</tr>
<tr>
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<td>0</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>E</td>
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TABLE 2

<table>
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<tr>
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<td>50</td>
<td>0/50</td>
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<tr>
<td>E</td>
<td>79</td>
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DISCUSSION

Crimean-Congo hemorrhagic fever is reported to be highly contagious with mortality of approximately 15–100%. The recommended safety measures include barrier nursing, isolation of the patient, and gloves, gowns, face shields, and goggles with side shields when contacting the patient or the soiled environment. There is insufficient data to support transmission by an airborne mechanism. Airborne transmission in animals was noted in some studies and was used to justify the stringent precautionary methods. Concerns have also been raised about two nosocomial cases that occurred in South Africa without any documented evidence of direct exposure to infectious material. However, all other evidence ruled out airborne transmission. In our experience, none of the contacts developed the disease after sharing the same environment as the index or the secondary cases. Of the 190 listed contacts, 2 (1.05%) developed the disease; both were the contacts of index case.

Percutaneous exposure remained the highest risk of transmission. An attack rate of 50% was seen in contacts that had a percutaneous or equivalent exposure (category A) (Table 2). However, due to the fact that the number of contacts who had category A exposure was small (four), we recommend interpreting these findings with caution. The percutaneous exposure that occurred from the index case to secondary case 1 was either in the form of saliva or respiratory secretions coming in contact with buccal mucosa or blood contact with broken skin not evident by the naked eye. The risk of cutaneous transmission through unnoticed skin breach necessitates cautious handling of blood and blood products. The male intern noted appreciable contact of respiratory secretions of index case with his eyes and face. Recommendations demand use of face shields or surgical masks, and wearing eye protection by persons coming within approximately three feet of the patient to prevent contact with blood, other body fluids, secretions, or excretions.

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REFERENCES


