CONCISE COMMUNICATION

Risk of Nosocomial Transmission of Nipah Virus in a Bangladesh Hospital

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We conducted a seroprevalence study and exposure survey of healthcare workers to assess the risk of nosocomial transmission of Nipah virus during an outbreak in Bangladesh in 2004. No evidence of recent Nipah virus infection was detected despite substantial exposures and minimal use of personal protective equipment.

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Nipah virus was first identified during outbreaks of encephalitis in Malaysia and Singapore in 1998 and 1999.[1-6] Detection of Nipah virus in urine, respiratory secretions, and cerebrospinal fluid means that healthcare workers are theoretically at risk for infection.[2,7,8] Studies from Malaysia and Bangladesh indicate that the risk of nosocomial transmission of Nipah virus is low[8-10]; however, nosocomial transmission was identified in an outbreak of infection with Nipah virus in Siliguri, India.[9,11] Given known modes of transmission of Nipah virus, healthcare workers have been advised to follow standard and droplet precautions.[8,12]

Four outbreaks of Nipah virus–associated illness were documented in Bangladesh from 2001 through 2004.[10,13,14] The third outbreak occurred between January and February 2004 and was centered in the Rajbari District, west of Dhaka. Twelve residents of 2 adjacent villages became seriously ill with fever and altered mental status; 10 died.[13] Because of increased surveillance for encephalitis during this time, an additional 19 cases of Nipah virus infection were identified in 7 districts around central and northwestern Bangladesh.[13] The case-fatality ratio for these patients was 74% (23 of 31).

During the outbreak reported here, 7 patients with serologically confirmed Nipah virus infection presented to a tertiary care center in Dhaka with fever and altered mental status 2-8 days after their illness onset. Five of the patients also presented with cough or respiratory distress. We conducted an antibody prevalence study of healthcare professionals who provided care to these patients to identify nosocomial transmission and define specific risk factors for transmission.

METHODS

This study was conducted at Dhaka Medical College Hospital, which is the largest tertiary care facility in Bangladesh. A list of all healthcare workers who worked on wards with at least 1 patient known to have Nipah virus infection was made using ward logs and interviews with key hospital staff. All healthcare workers, defined as physicians, nurses, cleaners, and other types of employed patient attendants (eg, laboratory technicians), who reported providing any care to a patient with Nipah virus infection confirmed by laboratory detection of IgM antibodies against the virus during this period were eligible for the study. After the healthcare workers provided informed, written consent, a 5-mL blood specimen was obtained and information about the type of contact with a patient with Nipah virus infection, use of personal protective equipment, illness history, travel history, and basic demographic characteristics was collected. Serum specimens were tested at the Centers for Disease Control and Prevention (Atlanta, GA) with an IgM-capture enzyme immunoassay for detection of IgM antibodies and an indirect enzyme immunoassay for IgG antibodies that used Nipah virus (Malaysian prototype) antigens.[15] Test results were communicated to study participants in a confidential, sealed envelope. Approximately 10 weeks after the first interview and blood specimen collection, all healthcare workers with positive test results in the initial sample received a follow-up interview to gather in-depth information about their care-giving practices, personal-protection practices, and illness history. A second blood specimen was also obtained at this time to identify any change in antibody titers.

RESULTS

In total, 105 healthcare workers (26 physicians, 68 nurses [including nursing students], and 11 cleaners or other patient attendants) were enrolled in the study from March 24-30, 2004, after reporting that they provided care to a patient with Nipah virus infection between January 18 and February 24, 2004. One employee, a physician, refused to participate in the study. An unknown number of student nurses who may have cared for patients with Nipah virus infection could not be located at the time of the study, because they were no longer working at Dhaka Medical College Hospital. Although every effort was made to list all healthcare workers exposed to patients infected with Nipah virus, it is possible that the list was incomplete. The mean age of study participants was 28 years (range, 17-60 years); most (73%) were women.

The most commonly reported type of contact with a patient with Nipah virus infection (50% of study participants) was washing or changing bed sheets (Table). A few healthcare workers (28%) reported using any kind of personal protective equipment "most of the time" while caring for Nipah virus–

TABLE. Type of Healthcare Worker Exposures to Patients With Nipah Virus Infection During January and February 2004 at Dhaka Medical College Hospital, Dhaka, Bangladesh

Type of exposure	No. (%) of healthcare workers exposed (n = 105)
Washing and changing bed sheets	52 (50)
Performing a physical examination	38 (36)
Drawing blood	35 (33)
Direct skin contact with respiratory secretions, stool, urine, or blood	30 (29)
Providing suction	27 (26)
Giving an injection	25 (24)
Placing a canula	17 (16)
Placing a nasogastric tube	11 (10)
Performing funduscopy	10 (10)
Changing bedpans	7 (7)
Receiving a needlestick injury	7 (7)
Performing lumbar puncture	6 (6)
Being splashed in the eye, nose, or mouth with respiratory secretions, stool, urine, or blood	6 (6)
Placing a catheter	2 (2)

infected patients. Twenty-three (34%) of 68 nurses reported using personal protective equipment, compared with 5 (19%) of 26 physicians. Of the 29 respondents (28%) who said they used personal protective equipment "most of the time" while caring for patients with Nipah virus infection, latex gloves were used by 25 (86%), and surgical masks were used by 7 (25%). Use of eye protection was negligible. Thirty-four study participants (32%) reported having had unprotected exposures to potentially infectious bodily secretions while providing care for patients infected with Nipah virus, including receipt of a splash in the eye, mouth, or nose with a bodily secretion or a needlestick injury (Table 1).

No study participants had IgM antibodies against Nipah virus. However, 2 nursing students who reported changing bed sheets for patients with Nipah virus infection had IgG antibodies against Nipah virus (IgG antibody titer, 1 : 400), suggesting previous infection. Neither of these nursing students reported any known unprotected exposure to body fluids of patients with Nipah virus infection or a history of travel to areas in which there was an outbreak of Nipah virus infection. Only one of the nursing students reported using personal protective equipment (ie, mask and gloves) while caring for these patients. Although this student reported that she had had measles approximately 3 months before the study (her measles vaccination status was unknown), neither she nor the other nursing student reported any lifetime history of febrile illness associated with altered mental status. Approximately 2 weeks after first providing care to a patient with Nipah virus infection, the second nursing student experienced a febrile illness with headache. No change in antibody titers was observed between the first and second blood specimens collected from either student (IgG antibody titer, 1 : 400 for both students). Although 12 healthcare workers (11%) reported experiencing a febrile illness between January 18 and the end of March 2004, none reported experiencing altered mental status.

DISCUSSION

Although healthcare workers commonly had unprotected exposures to potentially infectious bodily secretions of patients with Nipah virus infection, no evidence of acute Nipah virus transmission to healthcare workers was observed in this study. Neither healthcare worker with IgG antibodies against Nipah virus reported a history of illness with altered mental status in their lifetime. It is possible that they experienced a mild form of Nipah virus–associated illness, as described during the outbreak in Malaysia,[16] or, albeit less likely given the size and diversity of the Paramyxoviridae family, that the antibodies detected were in response to infection or exposure to another pathogen and were cross-reactive with Nipah virus antigens. Given that IgM antibodies persist in the serum of most patients with Nipah virus infection for at least 3 months after illness onset,[17] the absence of IgM antibodies only 4-7 weeks after exposure and the low and unchanging IgG antibody titers indicate that these staff members were not infected with Nipah virus during this outbreak. These nurses had no known previous exposure to other patients with Nipah virus infection.

Evidence of person-to-person transmission of Nipah virus,[9,14] coupled with previous findings about the presence of virus in respiratory secretions, urine, and cerebrospinal fluid, indicates that nosocomial transmission of Nipah virus is plausible, and infection control practices need to consider this possibility, even in the absence of transmission in this study.[2,7,8] Differences in the risk of nosocomial transmission between outbreaks could be explained by strain variation or patient-care practices in medical facilities.

Use of personal protective equipment in this study group was low and unprotected exposures common. These findings are consistent with other reports of personal protective equipment use and needlestick injuries from developing countries[18,19] and are likely associated with a lack of knowledge about transmission risk for healthcare workers and the limited availability and access to personal protective equipment in this resource-poor setting.

The findings of this study are limited because of the amount of time between the exposure and the first (4-7 weeks) and follow-up (10 weeks) interviews, which may have increased recall bias. It is possible that healthcare workers who cared for patients with Nipah virus infection may not have remembered doing so and were therefore excluded from the study. Likewise, study participants who remembered caring for patients with Nipah virus infection may not have recalled all their specific patient care activities or any signs of illness they may have had. However, because of the high

profile of the outbreak and fear of nosocomial transmission, it is unlikely that healthcare workers who spent a significant amount of time caring for patients with Nipah virus infection or who experienced serious illness after their exposure would be unable to recall such an event. It is also possible that study participants exaggerated their use of personal protective equipment because of messages they received during the outbreak that reinforced standard precaution use. Therefore, the risk of exposure to study participants may be greater than we have reported.

The risk of nosocomial transmission of Nipah virus during this outbreak appears to be low but likely not negligible. Given the reports published elsewhere on possible nosocomial transmission[9,11] and the 2 IgG antibody–positive participants and lack of personal protective equipment use by healthcare workers in our study, interventions to improve infection control are needed, especially during outbreaks.

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