Costs and benefits of varicella screening and vaccination for healthcare workers at a general hospital

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ABSTRACT

Objective: To demonstrate the costs and benefits of screening and vaccinating varicella-susceptible healthcare personnel at a general hospital with live attenuated varicella-zoster virus vaccine.

Methods: Screening of healthcare workers at Almana General Hospital, Al-Khobar, Dammam for varicella-zoster antibody by indirect fluorescent antibody.

Results: Out of 757 healthcare workers, 511 (62.5%) had a definite history of varicella-zoster virus infection in the past. Of 161 healthcare workers with no history of varicella-zoster virus infection, 129 (80%) were positive for varicella-zoster antibody when tested by indirect fluorescent antibody. There were 28 cases of chickenpox among hospital staff in one year, and they were excluded from contact with patients for 5-7 days each.

Conclusion: Adopting varicella screening and vaccination of susceptible healthcare workers in a general hospital would be cost-effective and will result in improved patient care.

Keywords: Varicella, healthcare workers.


Varicella (chickenpox) is an acute, highly contagious disease, which is transmitted directly through personal contact or droplet spread, and indirectly by fomites. It causes a systemic infection that generates life-long immunity. Varicella-zoster virus (VZV) is the causative agent of chickenpox and herpes zoster (shingles).1 Chickenpox results from exposure of a susceptible person to the varicella-zoster virus. Exposure to the virus is common in healthcare settings.2 The secondary infection rate among exposed household contacts can be as high as 80% to 90%.3 The incubation period is between 2-3 weeks. Following primary infection, the virus becomes latent in the dorsal root ganglia. Reactivation of the dormant virus at a later time results in herpes zoster. Varicella usually causes a benign, self-limited disease in children.4 In adults and immunocompromised patients, the disease can be more severe and may be associated with serious complications such as pneumonia and encephalitis,5 and the death rate is more than 20 times higher than in children.6 The cost of controlling chickenpox and herpes zoster in the hospital setting can be substantial, as identification of susceptible hospital staff and patients is time consuming and expensive.7,8

The purpose of this study is to demonstrate the costs and benefits of chickenpox screening and vaccination of healthcare personnel in a general hospital.

Methods. This study was carried out at the Almana General Hospital at Al-Khobar and Dammam. The hospitals are located in the Eastern Province of the Kingdom of Saudi Arabia. Varicella-zoster antibodies were detected by the VIRGO Varicella-Zoster Virus IgG indirect fluorescent

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antibody (IFA) test (Hemagen Diagnostics, Inc, Columbia). A titer of 1:8 or greater was interpreted as positive for VZV IgG antibody. A titer of less than 1:8 was considered as a negative test and susceptible to primary VZV infection.

**Results.** When 757 health care workers in Almana hospital were asked about their history of chickenpox/shingles, 511 (62.5%) gave a definite history of chickenpox in the past, and they were not tested for VZV antibody. Screening for varicella-zoster antibody was carried out on 161 staff working in clinical areas. There were 129 (80%) staff who were positive for varicella-zoster antibody, despite giving a negative history of varicella infection. The total number of chickenpox cases among healthcare workers from June 1998 to June 1999 was 28 cases. Of these, 15 cases were among nurses working in clinical areas including the Pediatric Long Term Care Unit, the Special Care Baby Unit, the Intensive Care Unit, and the Renal Dialysis Unit. All these cases developed clinical disease, were excluded from contact with patients until they recovered and were no more infectious. Close contact among staff of chickenpox cases were roommates living in the same accommodation as index cases. These were excluded from contact with patients, from day 10 through day 21 following exposure. The majority of these nurses who were in contact with cases of chickenpox were off work and sent home on paid leave, others were given non clinical duties.

**Discussion.** This study was conducted to demonstrate the costs and benefits of a screening and vaccination program for varicella-susceptible employees in our hospital. Nosocomial transmission of VZV can occur following exposure to patients, healthcare personnel, and visitors with either varicella or herpes zoster. All susceptible adults in healthcare settings are at risk for varicella and its complication. The disease can be severe in high-risk patients. Control and surveillance for cases of varicella and herpes zoster in our hospital is conducted by the Infection Control Doctor (ICD) and the Infection Control Nurse (ICN). Patients with VZV infection are placed on droplet and contact isolation until all the skin lesions are crusted. Only personnel who are known to be immune to varicella look after these patients. Susceptible contacts, including patients and staff, are identified, and varicella zoster immune globulin is given when indicated. Hospital personnel with varicella are infectious from 2 days before the onset of rash, and may spread the virus among patients. Susceptible healthcare personnel who are exposed to patients with chickenpox or herpes zoster are excluded from contact with patients for the entire communicable period from day 10 through day 21 following the exposure. If they contract varicella, the period of exclusion is extended until all the vesicles are dried and crusted over.

There were 28 cases of chickenpox among our hospital staff from June 1998. They were excluded from contact with patients for 5-7 days after the appearance of skin rashes. Before the screening program for varicella was introduced in our hospital, all varicella-susceptible staff in close contact with the index case were excluded from contact with patients for the entire communicable period (12 days) and were either sent home on paid leave, or were given non clinical duties.

The infection control committee in the hospital has prepared and introduced a varicella screening and vaccination program for healthcare workers in order to establish, and document, their varicella immune status, and vaccinate the susceptible healthcare personnel. The main costs of providing this program will be for the screening tests, and the vaccine. The cost of screening for varicella-zoster antibody (VZIgG) by IFA is 25 Saudi Riyals (SR) per test. The number of staff tested was 161 at a direct cost of 4025 SR. Varicella vaccine will be needed to immunize susceptible healthcare workers who are negative for VZV antibodies. For adults, 2 doses of the vaccine have been recommended. The varicella vaccine (Varivax - MSD) costs 165 SR/vial. Vaccinating the 32 staff who were negative for VZIgG will cost 10560 SR. The total cost of the screening and vaccination program for 161 staff is 14585 SR. With the availability of varicella-screening facilities, the expensive VZ immunoglobulin will not be given unnecessarily to patients who are positive for VZ antibodies. Currently the cost of 1000 mg of VZ immunoglobulin (Varitect-Biotech) is 1200 SR. As a history of varicella is highly correlated with immunity, there may be no need to test individuals with a history of varicella to confirm that they are immune. Our results of screening 161 hospital staff for VZ-IgG, showed that 129 (80%) were positive for VZ antibodies, despite giving no positive history of chickenpox. These results reinforce the view that there is no need to test healthcare workers with a history of varicella to confirm that they are immune. The Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention (CDC) accepts a “reliable” history of varicella as evidence of immunity to the disease.

Low rate of seronegativity has been found in individuals with positive histories of varicella or zoster. However, in hospitals were many of their employees are from tropical and subtropical regions, these employees are more likely to be susceptible to varicella compared to those from temperate areas. In such hospitals, it may be more appropriate to check the immune status of healthcare workers regardless of clinical history, and especially of staff.
caring for patients at a high risk of developing severe varicella with serious complications, such as premature infants and those who are immunocompromised. Immunization of susceptible healthcare workers against varicella-zoster has been recommended. The vaccine is offered to non-immune staff who have not previously received varicella vaccination. The varicella screening and vaccination program will be cost effective to the hospital, because through the screening and vaccination program, hospital staff will be categorized as immune, and thus obviate the need for serological testing, clinical surveillance, and the need to remove the employees from the workplace following exposure to varicella and herpes zoster. The varicella screening and immunization program will ensure to curtail, if not eliminate, the lost working hours that results from unexpected absences following exposure of hospital staff to VZV, and minimize the time required for contact investigations. In addition, in the absence of varicella-screening facilities to screen patients exposed to staff with VZV infection for VZIgG antibody, varicella-zoster immunoglobulin may be given unnecessarily to these patients.

References