Incidence of herpes zoster and seroprevalence of varicella-zoster virus in young adults of South Korea

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Summary

Objectives: This study was performed to determine the incidence of herpes zoster and seroprevalence of varicella-zoster virus (VZV) in young adults of South Korea, where VZV seroprevalence remains relatively high.

Methods: In South Korea, military service is compulsory for all healthy young men and hence those in military service might provide a reflection of the general population. The computerized database of the Armed Forces Medical Command was examined to identify the number of reported herpes zoster cases. In order to evaluate VZV seroprevalence, serum samples were obtained from randomly selected subjects among those who had been admitted to the Armed Forces Capital Hospital.

Results: A total of 705 cases of herpes zoster were reported between June 2004 and May 2005. The annual incidence rate of herpes zoster was 141 (95% CI 131.0—151.8) per 100 000 population. A total of 192 subjects were enrolled for the analysis of VZV seroprevalence. All subjects were male and their median age was 21 (range 19—24) years. The overall anti-VZV IgG seropositivity prevalence was 92.7% (178/192, 95% CI 88.0—95.7%).

Conclusion: We have described a population-based study of the epidemiology of VZV infections in the military personnel of South Korea.

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Introduction

Varicella-zoster virus (VZV) is a ubiquitous human herpesvirus that causes varicella (chickenpox) and herpes zoster.\textsuperscript{1,2} After primary infection the virus establishes latency in cells of
dorsal root ganglia and reactivates as herpes zoster in approximately 15% of infected individuals over a lifetime.\textsuperscript{1,2} In temperate climates, chickenpox is predominantly a disease of childhood: seroprevalence studies show that 90% of children have antibodies by the age of 15.\textsuperscript{3} In contrast, in tropical areas, chickenpox occurs at older ages, around 20–25 years, with the risk of developing more severe disease.\textsuperscript{4} Herpes zoster can occur any time after varicella, but the incidence increases with age.

There are few population-based studies on the epidemiology of herpes zoster, and contemporary estimates of herpes zoster incidence are lacking. Furthermore, little data regarding incidence and seroprevalence of VZV infections are available in South Korea, which is a typically high seroprevalence country. We thus describe a population-based investigation of the incidence of herpes zoster and seroprevalence of VZV in young adults of South Korea, where VZV seroprevalence remains relatively high.

Methods

In South Korea, military service is compulsory for all healthy young men and hence those in military service might provide a reflection of the general population, provided that the sample population is corrected with respect to age and gender distribution. The computerized database of the Armed Forces Medical Command was examined to identify the number of reported varicella and herpes zoster cases. In the Korean Army, there is compulsory notification of individual cases of communicable diseases, including VZV infection, to the Department of Preventive Medicine in the Armed Forces Medical Command. Firstly we extracted data from the Defense Medical Information System (DEMIS) and analyzed data for varicella and herpes zoster cases that were submitted between June 2004 and May 2005. The annual incidence rate was defined as cases per 100 000 people per year among approximately 500 000 soldiers.

Secondly, we evaluated the seroprevalence of VZV infection. A total of 254 serum samples obtained from inpatients for various laboratory tests between September 2005 and February 2006 at a medical ward of the Armed Forces Capital Hospital were available for analysis. This hospital provides medical care to the troops that are stationed in the area adjacent to Seoul, the capital of South Korea. Fifty-four patients were excluded: those over 25 years of age, those with chronic diseases such as cancer, diabetes mellitus, and chronic renal diseases, those with varicella, those with herpes zoster, immunocompromised cases including HIV patients, and females. We, therefore, planned to obtain a specific study group that included healthy young military personnel. Of 200 subjects enrolled in the seroprevalence study, eight subjects refused to participate. Thus, a total of 192 subjects were included in the analysis of VZV seroprevalence. For the study population, information on their history of varicella disease and then informed consent were obtained. This study was approved by the institutional review board of the Armed Forces Capital Hospital. Serum analyses were performed at Seoul Clinical Laboratories (Seoul, Korea). Anti-varicella virus IgG antibodies (anti-VZV IgG) were determined using Vircell ELISA kits (Vircell, Spain). The test was performed in an automated format and cut-off values were established according to the manufacturer’s instructions. We calculated the prevalence of VZV antibody as the number of tests for which results were positive divided by the total number of tests performed, with exact 95% confidence intervals (95% CI) for proportions. Descriptive analysis including 95% CI was performed using the GraphPad QuickCalcs website for statistics (http://www.graphpad.com/quickcalcs).

Results

A total of 197 varicella cases and 705 herpes zoster cases were reported between June 2004 and May 2005. The annual incidence rates of varicella and herpes zoster were 39.4 (95% CI 30.1—49.1) and 141 (95% CI 131.0—151.8) per 100 000 people, respectively, based on the reported cases among approximately 500 000 soldiers. No seasonal variation in the monthly incidences was found.

A total of 192 patients were included for the analysis of VZV seroprevalence. All patients were male and their median age was 21 (range 19—24) years. The overall anti-VZV IgG seropositivity prevalence was 92.7% (178/192, 95% CI 88.0—95.7%). Of the 113 patients responding ‘no’ or ‘unknown’ to inquiries about their history of chickenpox, 102 (90.3%) were found to be VZV seropositive. Of the 79 patients responding ‘yes’ to inquiries about their history of chickenpox, 76 (96.2%) were found to be VZV seropositive.

Discussion

In South Korea, susceptibility to VZV infections in adult populations is not well established. Also, data for the incidence and seroepidemiology of VZV infections in young adults have not previously been available. To the best of our knowledge, this is the first study to report on the extent of VZV infection in young soldiers in the army of South Korea, where military service is compulsory for all healthy young men. Over 90% of young adults in South Korea and in many other countries have serologic evidence of VZV infections and are at risk for herpes zoster. Table 1 shows recent data regarding VZV seroprevalence in adolescents or young adults in other countries.\textsuperscript{5–8} Increasing age is a key risk factor for the development of herpes zoster. The other well-defined risk factor for herpes zoster is altered cell-mediated immunity. In this study population including young adults, the annual incidence of herpes zoster was 141 per 100 000 people. It is noted that herpes zoster occurred frequently in otherwise healthy military personnel. However, even in previously healthy infants and children, herpes zoster can occur at any time after varicella or varicella vaccination.\textsuperscript{9}

Approximately 7% of people were vulnerable to varicella in our study population. Even though complications are rarely seen, they could cause high morbidity and mortality in military personnel. In 1995, varicella vaccination was introduced into the infant immunization schedule in the USA.\textsuperscript{10} In order to develop vaccination protocols and take appropriate preventive healthcare measures against diseases in different countries, it is very important to know the seroepidemiology of any disease for that individual country. The present study provides epidemiological data on VZV infections in Korean military personnel based on the reported incidence data and the determination of specific anti-VZV antibodies. However, the population of this study was limited to young men and no
women were included. Epidemiological studies including the general population are also warranted.

A reliable history of chickenpox is usually consistent with immunity. Those without such a history are considered susceptible and can be tested to determine immune status or be empirically vaccinated.\(^1\) Our evaluation of the serologic status of young adults ranging in age from 19 to 24 years, reflects an overall varicella immunity of 93%, and approximately 90% of adults who do not have a reliable history of varicella are actually immune. Although a cost-effectiveness analysis was not performed, our data suggest that serologic testing before vaccination is likely to be cost-effective for young adults, especially for those with negative varicella history.

This study was based on routinely reported data and recorded information. Although this type of study has the advantage of allowing the study to be completed rapidly and at a low cost, the quality of the data is sometimes not optimal. Although the diagnosis of varicella or herpes zoster is relatively simple in clinical practice without being confused with other conditions causing vesicles, cases with minor symptoms would not have been included in the data if physicians had not seen them. However, clinical disease is sufficiently severe that few cases would not come to the attention of medical personnel in a modern military organization.

In conclusion, we have described a population-based study of the epidemiology of VZV infections in young soldiers of South Korea. The annual incidence rate of herpes zoster was 141 per 100 000 people, and the overall VZV seroprevalence was approximately 93% in young adults of South Korea.

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