

## Seroprevalence of varicella antibodies in healthcare workers in Imam Reza hospital of Kermanshah-Iran

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### ABSTRACT

The objective of this study was to assess the seroprevalence of varicella antibodies in healthcare workers and students of healthcare professions and to determine the validity of the self-reported varicella and zona history for detecting susceptible subjects. Personnel of Imam Reza hospital (Kermanshah-Iran) and students were recruited and a 5 mL blood sample was obtained from all participants. A case report form, including previous self-reported history of varicella and zona, was completed. A total of 188 healthcare workers (mean age, 30.6 years; S.D., 4.0; range, 23–40) and 62 students (mean age, 19.8 years; S.D., 2.5; range, 18–25) were recruited. The prevalence of varicella antibodies was 84.5% in healthcare workers and 84.5% in students. The preferred approach in these groups at risk of varicella will be to undergo serologic testing before immunization in those with negative or unknown history of varicella.

**Key words:** Antibodies; Healthcare workers; Varicella, Iran.

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## 1. Introduction

Varicella (chicken pox) is an acute, highly contagious disease, caused by the varicella zoster virus (VZV), usually a benign disease, is associated with serious complications in both previously healthy and immunocompromised persons (Kanra et al., 2003; Lyznicki et al., 1998; White, 1997). In developed countries, most cases occur in children, leading to high levels of immunity among adults. However, susceptible adults have a higher risk of severe disease and complications (Meyer et al., 2000). Age-specific seroprevalence describe the dynamics of primary varicella in the population and show the proportion of individuals remaining susceptible at a given age (Aebi et al., 2001). Healthcare workers may have a higher risk of exposure to varicella due to possible contact with cases (Kanra et al., 2003). Thus, susceptible healthcare workers and health sciences students are at increased risk of infection and, if infected, can expose susceptible patients to risk. Airborne nosocomial transmission of varicella-zoster virus (VZV) has been previously reported and existing guidelines recommend that all healthcare workers should ensure their immune status to varicella (HICPAC, 1997; Kanra et al., 2003). A paper concluded that VZV susceptibility in the studied age groups was higher than the expected rate, therefore childhood VZV vaccination is recommended in Shiraz-Iran (Motamedifar et al., 2006). Antibody testing is the most accurate way to show susceptibility to infection. However, systematic testing before immunization will not be the most appropriate strategy for economic and logistic reasons. Because the varicella-related rash is distinctive, a reliable history of varicella could be a valid method for detecting susceptible individuals (Centers for Disease Control and Prevention, 1996). This is of particular importance within groups of population at risk of exposure and transmission, as healthcare workers (Burnham et al., 2002). The objective of this study was to assess the seroprevalence of varicella in Imam Reza hospital of Kermanshah, Iran healthcare workers and health science students.

## 2. Methodology

### 2.1. Study population

Healthcare workers were recruited from the Imam Reza Hospital in Kermanshah, Iran. University students in hospital training were recruited on a voluntary basis from the Kermanshah University Of Medical Sciences, Iran. All subjects were informed about the study rationale and objectives, and were asked to sign an informed consent form. Subjects were excluded if they had a history of varicella vaccination or had received immunoglobulin in the previous year. A brief case report form was completed, including socio-demographic characteristics (age and sex) and

history of exanthematic diseases, including varicella and Zona. A 5 mL blood sample was obtained for anti-VZV antibody testing.

### 2.2. Laboratory methods

Serum samples were stored at  $-20^{\circ}\text{C}$  until serological analysis in the laboratory of Medicine School, Kermanshah University Of Medical Sciences, Iran. A commercial ELISA method (Enzynost anti-VZV IgG Dade Behring, Marburg GmbH, Germany) was used to determine the presence of IgG anti-VZV antibodies. This technique, that uses whole VZV antigens, has a very good correlation with the natural infection (Diaz et al., 1988). The assay was performed according to the manufacturer's instructions. Seropositivity was defined as an absorbance variation  $>0.2$  U/mL. According to the manufacturer, sensitivity and specificity are 99.4% and 99.8%, respectively.

### 2.3. Statistical methods

Mean comparisons for continuous variables were done using independent groups t tests. Proportion comparisons for categorical variables were done using  $\chi^2$  tests, although the Fisher exact test was used when data were sparse. Significance was set at  $P < 0.05$  using 2-sided comparisons. Statistical analysis was performed using the SPSS software (version 8.0; Chicago, IL, USA).

## 3. Results

A total of 188 healthcare workers and 62 students were included in the study. Mean age of the healthcare workers and students was 30.6 years (S.D., 4.0; range 23–40) and 19.8 years (S.D., 2.5; range, 18–25), respectively. Sixty-nine percent of healthcare workers and 54% of students were females. The overall prevalence of varicella was 84.5% (159/188) in healthcare workers and 84.5% (53/62) in students. No statistically significant differences in prevalence were found between study groups, nor between male and females within groups ( $p < 0.05$ ). A positive history of varicella and Zona was reported by 42% and 6% of healthcare workers and 30% and 3.2% of students respectively (Table 1).

**Table 1.** Self-reported history of varicella and Zona results in healthcare workers and students of health sciences.

Study groups		Varicella history	Zona history
Healthcare workers	Positive	79	11
	Negative	109	177
	Total	188	188
Health sciences students	Positive	19	2
	Negative	43	60
	Total	62	62

Characteristics of the study group in Healthcare workers and Health sciences students are present in Table2.

**Table 2.** Characteristics of the study group in 2 different hospitals.

	Healthcare workers	Health sciences students
Female sex	130	34
Mean age, yr	30.6	19.8
Years of employment or study		
≤1	22	28
1-6	96	32
≥7	70	2
Professions		
Physicians	40	-
Nurses	103	-
Housekeeping staff	27	-
Others (laboratory technicians)	18	-

Relationship between the history of varicella infection and the positive varicella IgG testing are present in table3.

**Table 3.** Relationship between the history of varicella infection and the positive varicella IgG testing in relation to nationalities.

	Positive history	Seropositive	Total percent
Varicella in healthcare worker	79	71	90%
Zona in healthcare worker	11	10	91%
Varicella in student	19	18	94%
Varicella in student	2	2	100%

#### 4. Discussion

An increase in the susceptibility to varicella among teenagers and young adults has been reported in some developed countries (Gray et al., 1990; Miller et al., 1993; Ronan et al., 2001). The epidemiological pattern of VZV infections should be reviewed periodically for evidence of a shift in the age of contact with VZV that could be associated to an increased proportion of susceptible adults, which may imply an increase of varicella-associated complications ( Miller et al., 1993; Ronan et al., 2001). Our study shows that 16% of healthcare workers and health sciences students in Imam Reza hospital of Kermanshah, Iran are susceptible to VZV based on the absence of detectable antibodies. These results are somewhat lower than rates found in studies carried out in similar studies (Brunell et al., 1999; Cologni et al., 2007 ; De Juanes et al., 2005; Dos Santos et al., 2008; Hatakeyama et al., 2004; Qureshi et al., 1999; Vandersmissen et al., 2000; Yavuz et al., 2005). It has been suggested that immunity levels of 94% or more are needed to interrupt virus transmission and that lower levels

in healthcare workers will not be sufficient to prevent a varicella outbreak in healthcare settings (Centers for Disease Control and Prevention, 1996; Committee of Infectious Diseases, 2000). Moreover, 51.6% of the study populations were females between 20 and 40 years of age, that have the additional risk of foetal or neonatal sequelae in case of infection during pregnancy (Salle-ras et al., 2001; Smith et al., 1998; Suárez et al., 2002; Waclawski et al., 2002).

Forty-two percent and 6% of healthcare workers and 30% and 3.2% of students reported to have a positive history of varicella and zona respectively. Ninety-one percent and 100% of health workers and student who reported have a positive history of varicella and zona were se-ropositive respectively. Therefore, a positive history of zona is highly predictive of positive serology in healthcare workers and health sciences students.

It can be suggested that screening and vaccination of healthcare workers and health sciences students in Imam Reza Hospital of Kermanshah would reduce VZV susceptibility.

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