Seroprevalence of Varicella-Zoster Virus in Children from Shiraz-Iran

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ABSTRACT

Background: Varicella–zoster virus (VZV) causes herpes zoster and varicella (Chicken-pox), usually a mild disease which is diagnosed clinically with few complications. However, in neonates and healthy adults it can have a severe presentation. Herpes zoster results from VZV reactivation later in life. **Objective:** To determine the seroprevalence of VZV in elementary school children aged 6-10 years in Shiraz, Iran. **Methods:** A cross-sectional seroprevalence survey was conducted on 270 healthy subjects. All serum samples were investigated for immunoglobulin G (IgG) antibody against VZV using a commercial enzyme linked immunosorbent assay (ELISA). **Results:** Among the studied population, 175 (64.8%) had no detectable antibody levels. The overall seroprevalence rate was 35.2%. A breakdown of seropositivity to VZV according to age was as follows; 10 years old, 50%, 9 years old, 48.2%, 8 years old, 27.3%, 7 years old, 32.1%, and 6 years old, 13.2%. **Conclusion:** As VZV susceptibility in the studied age groups was higher than the expected rate, therefore childhood VZV vaccination is recommended in our region.

Keywords: Seroprevalence, VZV, Children, Iran

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INTRODUCTION

Chicken-pox (varicella) is one of the mild exanthemic diseases of childhood, with the highest prevalence in the 2-6-year old age group (mostly seen in winter and spring in temperate conditions). Most people become infected before adulthood but 10% of young adults remain susceptible (1). Varicella can be especially fatal in neonates and healthy adults. Life-threatening varicella pneumonia can occur in adults with complications especially in those with immunodeficiency (2, 3). The causative agent of chickenpox, varicella zoster virus (VZV) is a human alpha-herpesvirus which is also the etiologic agent of herpes zoster (shingles), a localized painful blistering skin rash, usually confined to a dermatome. Live vaccines are available for chickenpox prophylaxis (4); it was approved for general use in children in the United States in 1995. A similar vaccine has been used successfully in Japan for about 30 years (1); however, it is not used worldwide.

Routine immunization against varicella is not currently practiced in Iran. In order to consider a vaccination policy and to later evaluate its efficacy, investigators need to know the age specific incidence of varicella. The aim of this study was to establish serosusceptible status of the Iranian population by screening VZV antibodies among healthy children aged 6-10 years.

SUBJECTS AND METHODS

Between September 2002 and April 2003, a cross-sectional seroprevalence survey was conducted on a population of 270 healthy primary school children aged 6 to 10 years in different areas of Shiraz, Iran. A complete physical examination was performed and an informed consent was obtained from all parents after a detailed explanation of the project.

Blood samples were then taken from each individual and the separated serums were stored at –20 °C until testing. Specific VZV IgG antibodies were detected using a commercial enzyme-linked immunosorbent assay (ELISA) kit (IBL, Hamburg, Germany). For each serum sample tested, the final absorbance value was calculated according to the manufacturer's instructions. Values above the cut-off point (10IU/ml) were considered to be positive, indicating previous exposure to VZV infection.

SPSS version 11.5 was used for statistical analysis. The Chi-Square and Fisher Exact test analysis were performed to test the differences in proportions of categorical variables between the two groups. P-values less than 0.05 were considered significant.

RESULTS

Specific VZV IgG antibodies were detected in 95 children out of 270, giving an overall prevalence rate of 35.2%. The mean age of seropositivity was 8.66±1.53 years. As shown in table 1, the seroperevalence percentage increased with age and reached 50% by the age of 10, except for the 8 year old group. Statistically, seroprevalence rates were significantly different in 6 year old group comparing to other age groups ($P<0.05$). Comparing antibody prevalence among boys and girls, no

gender preponderance was observed either in seroprevalence (P=0.811) or antibody titers (P= 0.631).

Table 1. Seroprevalence of VZV in studied children by age

Age (years)	No. of children	No. of seropositives	% Seropositivity
6*	53	7	13.2%
7	53	17	32.1%
8	44	12	27.3%
9	56	27	48.2%
10	64	32	50.0%
Total	270	95	35.2%

*Significant statistical difference ($p<0.05$) as compared with other age groups

DISCUSSION

We found that over 60% of the children less than 10 years old, screened in our study were seronegative for VZV IgG antibody and therefore were susceptible to varicella infection. As serologic data are not enough, drawing comparison is difficult, even with studies carried out in developed countries. This lack of evidence is expected since chickenpox is usually a mild disease, which is primarily diagnosed clinically and has few complications.

Age-related susceptibility to varicella in various regions of the world is well recognized (5, 6). A seroepidemiologic survey on 510 children in Spain who were less than 3 years old, revealed 9.5% seropositivity in the cohort study. This percentage increased rapidly in the 3-7-year old children and reached to 61% by 5 years of age and 80.8% in 8-year old children (7), although, overall seoprevalence in the latter report is much higher in the same age groups compared to our survey. The increase observed with age was also seen in our study (except for 8-year old group). A study in Brazil on 160 children showed about 80% VZV seropositiviy in 10-year old children (8). Serologic surveys in Japan also showed that 83% of 9-year old children were IgG positive. Other studies in the UK revealed that more than 50% of children around 3 years of age were infected with the virus (9).

Our findings are close to a study in the UAE which showed 45.8% seropositivity to VZV in children less than 10-year old and was similar to the results of surveys in tropical areas, at least for children under 10 years old (10). It has been observed that the epidemiology of varicella varies between temperate and tropical climates. In tropical areas, varicella typically occurs among older individuals who are at risk for developing more severe disease. Reasons for this dramatic difference in epidemiology are not clear (11, 12).

According to the literature, a majority of (about 85%) VZV infections occur during early childhood by the age of nine with a strong association between varicella infection and VZV seropositivity, so we expected a high percentage of seropositivity to varicella in children by age of 10 in our study (9, 13). However, this was not observed, therefore, it can be concluded that mild chicken-pox infection has not been very widespread during childhood in our region. Meanwhile, some epidemiological evidence from temperate areas such as the UK and the USA show an upward shift in the age distribution of varicella which potentially has important consequences for future morbidity and mortality in adults and especially pregnant women and health workers. The migration of non-immune and serosusceptible adults to temperate areas increases the significance

of varicella infection (10). So, as there might be a similar changing pattern of epidemiology in our area, further studies especially in other age groups are required in order to evaluate the cost benefit ratio for a universal vaccination program in early childhood e.g. 15 months in Iran, and/or a selective varicella vaccine recommendation particularly for women of childbearing ages and in adults.

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REFERENCES

1. Jawetz, Melnick and Adelberg's Medical Microbiology. 23nd Ed; McGraw-Hill Company. 2004: 438-442.
2. Randall G, Fisher MD, Edwards KM. Varicella-zoster. Pediatr Rev 1998; 19:62–7.
3. Zuckerman AJ, Banatvala JE, Pattison JR. Principles and practice of clinical virology, 2nd Ed; Wiley and Sons, 1990:43–68.
4. McCrary ML, Severson J, Tyring SK. Varicella zoster virus. J Am Acad Dermatol.1999;41:1-14.
5. Muench R, Nassim C, Niku S, Sullivan-Bolyai JZ. Seroepidemiology of varicella. J Infect Dis.1986;153:153-5.
6. Maretic Z, Cooray MP. Comparisons between chickenpox in a tropical and a European country. J Trop Med Hyg.1963;66:311-5.
7. Cilla Eguiluz G, Perez Trallero E, Garcia Arenzana JM. Seroepidemiology of varicella in children from Spain. J Infect Dis.1987;156:851.
8. Semenovitch I, Lupi O. A seroepidemiologic survey of the prevalence of varicella-zoster virus in the pediatric population in two university hospitals in Brazil. Int J Dermatol.2003;42:193-6.
9. Fairley CK, Miller E. Varicella-zoster virus epidemiology--a changing scene? J Infect Dis.1996;174:314-9.
10. Uduman SA, Tahira AM, Al-Wash R, Usmani MA, Bener A. Varicella susceptibility among children and healthy adults in the United Arab Emirates. East Mediterr Health J.2001;7:604-8.
11. Wharton M. The epidemiology of varicella-zoster virus infections. Infect Dis Clin North Am. 1996;10:571-81.
12. Lee BW. Review of varicella zoster seroepidemiology in India and southeast Asia. Trop Med Int Health 1998; 3:886-90.
13. Salleras L, Dominguez A, Vidal J, Plans P, Salleras M, Taberner JL. Seroepidemiology of varicella-zoster virus infection in Catalonia (Spain). Rationale for universal vaccination programmes. Vaccine.2000;19:183-8.