

Varicella susceptibility among children and healthy adults in the United Arab Emirates

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الاستعداد للإصابة بالحُمق بين الأطفال والبالغين الأصحاء في الإمارات العربية المتحدة

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الخلاصة: تم تعيين البينات السيرولوجية على عدوى فيروس الحُمق النطاقي بين الأشخاص الأصحاء من سن الرضاع إلى سن 47 عاماً، من المقيمين في هذه المنطقة. وتبين عدم وجود أضداد يمكن اكتشافها في 126 (19.4%) من 648 شخصاً ولذا فهم مستعدون للإصابة بالعدوى. وكان إجمالي معدل الانتشار المصلي بين البالغين (81.3%). كما تبين زيادة هذا المعدل بين مواطني الإمارات مع التقدم في السن؛ حيث بلغ هذا المعدل 45.8% في الأشخاص دون سن العاشرة، و68.4% في المجموعة العمرية 11-20، و89.5% في المجموعة العمرية 21-30، و94.7% في المجموعة العمرية 31-40، و88.9% في الأشخاص الذين تجاوزوا الحادية والأربعين. أما البالغون من أبناء شبه القارة الهندية والفلبين فقد كانت معدلات هذه الإصابة متغيرة بينهم، كما كان معدل الاستعداد المصلي أعلى بين السريلانكيين المقيمين في المنطقة، حيث بلغ 35%. ونظراً للمُتتبعات السريرية للحُمق على البالغين، فقد يكون استخدام اللقاح مفيداً للوقاية من هذا المرض.

ABSTRACT The serological evidence of varicella zoster virus infection was determined among healthy individuals from infancy to 47 years of age living in this region. Of 648 people, 126 (19.4%) had no detectable antibody and were susceptible to infection. The overall adult seroprevalence rate was 81.3%. The rate among Emirati citizens increased with age; < 10 years, 45.8%; 11–20 years, 68.4%; 21–30 years, 89.5%; 31–40 years, 94.7%; and > 41 years, 88.9%. Adults from the Indian subcontinent and Philippines had variable prevalence rates and Sri Lankans living in the region were highly serosusceptible (35%). Because of the clinical impact of varicella in adult populations, vaccine prevention might be beneficial.

La réceptivité à la varicelle chez des enfants et des adultes en bonne santé aux Emirats arabes unis

RESUME Les preuves sérologiques de l'infection par le virus varicelle zotonaux ont été déterminées chez des sujets en bonne santé de la petite enfance jusqu'à l'âge de 47 ans vivant dans cette région. Sur 648 personnes, 126 (19,4 %) n'avaient pas d'anticorps détectables et étaient réceptifs à l'infection. Le taux de séroprévalence global des adultes s'élevait à 81,3 %. Le taux chez les Emiriens augmentait avec l'âge; < 10 ans, 45,8 %; 11–20 ans, 68,4 %; 21–30 ans, 89,5 %; 31–40 ans, 94,7 %; et > 41 ans, 88,9 %. Les adultes du sous-continent indien et des Philippines avaient des taux de prévalence variables et les Sri Lankais vivant dans la région étaient hautement réceptifs (35 %). Du fait de l'impact clinique de la varicelle dans les populations adultes, la prévention par la vaccination pourrait être bénéfique.

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Introduction

Chickenpox, or varicella, is the most common exanthematous disease of childhood and is caused by varicella zoster virus (VZV). Infection is generally mild among paediatric age groups. Yet varicella-associated morbidity and mortality is an important clinical entity with global occurrence [1].

Life-threatening varicella pneumonia can occur in adults. It is well known to be especially severe in neonate and healthy adults. In immunocompromised individuals, VZV infection can be devastating and lead to progressive dissemination and death [2,3]. In some studies, the clinical and roentgenographic evidence of pneumonia complicating the course of varicella was seen in 4.3% of adult cases, with hospital case fatality of 0.5% [4,5]. Furthermore, there are reports of immunocompromised children who have acquired nosocomial varicella and died of disseminated diseases [4].

Notably large numbers of adult immigrants from South Asia in this region are hospitalized with severe varicella-related complications [5]. Routine immunization against varicella is not currently practiced in the United Arab Emirates (UAE). We aimed to establish serosusceptible status by screening VZV antibodies among a wide range of healthy children and adults.

UAE is a rapidly developing country with a diverse immigrant working population. This study was conducted in Al-Ain, an inland cosmopolitan city of desert origin, approximately 150 kilometres east of the capital, Abu Dhabi. It has a relatively cool, dry winter and a hot, dry summer. The region has a population of approximately 350 000 (1996 census). About 9% of the inhabitants are children under 10 years of age, 15% of the population is be-

tween 11 and 20 years and 47% of the population is between 21 and 40 years [6].

Methods

We conducted a cross-sectional seroprevalence survey of healthy individuals aged 8 months to 47 years. Assuming a prevalence rate of 9% in recent years (*Annual Report 1999*, Preventive Medicine Department, Ministry of Health, Abu Dhabi) and with 95% confidence interval and 5% error bound, a sample size of a minimum of 648 people was needed to meet the objectives of the study. Of the 648 people enrolled, 161 children and adults were UAE citizens. The other 487 people screened were expatriate adults from the Indian subcontinent or the Philippines. Adults and adolescents were recruited on a voluntary basis after informed consent or parental consent for children was obtained. Specimens from expatriate adult subjects were collected during clinic visits to the Preventive Medicine Department at the time of their residence visa renewal. Children were enrolled from the ambulatory paediatric clinic. The following five age groups were identified: < 10 years ($n = 48$); 11–20 years ($n = 38$); 21–30 years ($n = 257$); 31–40 years ($n = 199$); and > 41 years ($n = 106$).

Blood samples were taken from each individual and the separated serum was stored at -20°C until testing. Specific VZV IgG antibodies were estimated using a commercial enzyme-linked immunosorbent assay (ELISA) kit (Enzygnost, Behringwerke, Germany), which has a sensitivity of 85%–95% and specificity of 99% compared against fluorescent antibody to membrane antigen assay as the standard. For each serum sample tested, the final absorbance value was calculated according to the manufacturer's instructions. Values

above the cut-off point were considered to be positive, indicating previous exposure to VZV infection.

SPSS was used for statistical analysis. Data were expressed as mean and standard deviation (SD) unless otherwise stated. The chi-squared test for trend and Fisher exact test analysis were performed to test for differences in proportions of categorical variables between two groups. $P < 0.05$ was considered as the cut-off value for significance.

Results

Of the 648 participants screened, specific VZV IgG antibodies were detected in 522, giving an overall prevalence rate of 80.6%. The mean age and standard deviation of the expatriates was 35.5 ± 9.4 years. The prevalence rate among UAE citizen increased with age (Table 1). Among children under 10 years of age (mean 4.5 years), the rate was 45.8%; 11–20 years of age (mean 13 years), was 68.4%; 21–30 years of age (mean 25 years), 89.5%; 31–40 years of age (mean 34.5 years), 94.7 %; and over 41 years of age (mean 43 years), 88.9%. There were significant statistical differences between childhood and overall adult seroprevalence rates ($P = 0.0001$). Antibody

Table 1 Varicella zoster virus antibody prevalence among United Arab Emirates nationals by age

Age group (years)*	Total tested	Positive	
		No.	%
<10	48	22	45.8
11–20	38	26	68.4
21–30	38	34	89.5
21–40	19	18	94.7
>41	18	16	88.9
Total	161	116	72.0

*Prevalence among all adults ≥ 21 years of age, 68/75 = 90.7%.

prevalence among working expatriates living in the region according to age and nationality is given in Table 2. The overall prevalence rate of adults varied from 65.0% among Sri Lankans; 83.0% among Indians; 84.9% among Bangladeshis; 88.9% among Pakistanis; and 91.9% among Filipinos. There were no significance differences between the nationalities except for Sri Lankan adults who had remarkably low seroprevalence rates that were statistically significant ($P < 0.01$).

Table 2 Varicella zoster virus (VZV) antibody prevalence among expatriate adults by age

Age group (years)	Pakistan		India		Bangladesh		Sri Lanka		Philippines		χ^2 (P-value)
	+/No.	%	+/No.	%	+/No.	%	+/No.	%	+/No.	%	
21–30	40/44	90.9	28/38	73.7	54/66	81.8	18/32	56.3	36/39	92.3	19.58 (< 0.01)
31–40	28/32	87.5	36/44	81.9	36/40	90.0	20/30	66.7	32/34	94.1	11.04 (< 0.05)
> 41	28/32	87.5	24/24	100.0	0/0	–	14/18	77.8	12/14	85.7	5.34 (> 0.05)
Total	96/108	88.9	88/106	83.0	90/106	84.9	52/80	65.0	80/87	91.9	26.65 (< 0.01)

+ = VZV antibody detected; No. = number of studied subjects; % = seroprevalence rate.

Discussion

We found that over 50% of the UAE children under 10 years of age screened were seronegative for VZV antibody and were susceptible to varicella. Our findings agree with the regional clinical observations of the past several years that show a peak in childhood and decline to low levels thereafter [4–6]. The reasons for early exposure to varicella in our desert environment are not known exactly; socioeconomic development, living style and other social factors may play a role. Although high levels of varicella immunity (approximately 90%) were observed among UAE citizens over 21 years of age, there were a large number of adults from the Indian subcontinent living in the UAE who were still susceptible and at risk of severe infection.

Varicella is extremely contagious with secondary infection rates in susceptible household contacts approaching 90% [1–3]. The occurrence and spread of infection varies depending upon climate and susceptible individuals prevalent in the community. Age-related susceptibility to varicella in various regions of the world is well recognized [7–9]. In the United States, varicella occurs predominantly in children under 14 years of age and seropositivity reaches over 95% by the late teen years [2,8]. Reports from tropical countries indicate that varicella occurs in adults more frequently and apparently with severe clinical manifestations [9].

The epidemiology of chickenpox in tropical countries differs from that of temperate regions such as the United States, Europe and Japan. Although varicella is a childhood disease in temperate climates, it is often a disease of adults in tropical countries [7–9]. The migration of nonimmune and serosusceptible adults from tropical regions to Europe and the United States in-

creases the significance of varicella infections [10]. In one study of Sri Lankans, approximately 70% of children and 40% of adults developed chickenpox within the first few months of their arrival in the United States [2]. In our study, immigrant workers of 21–30 years of age, most notably Sri Lankans and Indians, had low seropositive rates, i.e. 56.3% and 73.7% respectively.

Environmental factors such as humidity and warm tropical temperatures are known to constrain virus survival. Hence exposure to infection at an early age is less likely, resulting in people remaining serosusceptible into adulthood. Serosusceptible individuals are poorly protected during migration to tropical regions or are at risk of serious disease during a varicella outbreak. Young adults from the Indian subcontinent in the UAE have experienced most of the severe cases of varicella with significant morbidity and mortality [4,5].

Varicella is now a vaccine-preventable disease with routine immunization of all children 12–18 months of age, and is also recommended for all susceptible individuals beyond childhood [11]. The VZV-related clinical burden could be reduced to a great extent with routine administration of varicella vaccine to all young children and to those individuals not previously infected. It is now more appropriate than ever before to weigh the clinical impact of varicella in developing countries such as the UAE and to develop vaccine recommendations.

Our regional study found that the data exhibited a pattern of varicella immunity prevalent among the child and adult population of the UAE. Children of school age and adolescents lacked immunity against varicella to a greater extent. The presence in the region of working expatriates from low seroprevalence countries might indicate a shift in epidemiology and might increase

the possibility of adult individuals acquiring severe varicella infection. This might burden clinics and cause economical losses in clinical settings. Our findings indicate strongly the importance of considering an early vaccination programme among this segment of the population. A nationwide seroepidemiological and disease surveillance study is warranted immediately and should be planned to coincide with the early introduction of varicella vaccination for UAE children and for those adults at risk.

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