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Seroprevalence of varicella-zoster virus in five US-bound refugee populations

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Abstract

Background—Little is known about varicella-zoster virus (VZV) susceptibility in US-bound refugee populations, although published data suggest that VZV seroprevalence in these refugee populations may be lower than US populations. We describe VZV seroprevalence in 5 U.S.-bound refugee groups: (1) Bhutanese in Nepal, (2) Burmese on the Thailand-Burma (Myanmar) border, (3) Burmese in Malaysia, (4) Iraqi in Jordan, and (5) Somali in Kenya.

Methods—Sera were tested for presence of VZV IgG antibodies among adults aged 18–45 years.

Results—Overall VZV seroprevalence was 97% across all refugee groups. VZV seroprevalence was also high across all age groups, with seroprevalence ranging from 92–100% for 18–26 year-olds depending on refugee group and 93–100% for 27–45 year-olds.

Discussion—VZV seroprevalence was unexpectedly high in these 5 US-bound refugee groups, though may not reflect seroprevalence in other refugee groups. Additional studies are needed to better understand VZV seroprevalence in refugee populations over time and by region.

Keywords

Varicella-zoster virus; varicella; VZV; seroprevalence; refugees

BACKGROUND

Although the majority of adults born in the United States are seropositive for antibodies to the varicella-zoster virus (VZV) [1], refugees arriving in the United States, particularly those from tropical climates, may have lower VZV seropositivity rates [1, 2]. Such persons are at risk for VZV infection as adults, who typically develop more severe disease [2]. Every year, the United States offers resettlement to approximately 50,000–75,000 refugees for whom

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repatriation to their country of origin or local integration in the host country is not a viable, durable solution. These refugees, representing more than 69 nationalities, are resettled from camps and urban locations in 92 host countries of asylum [3]. Approximately 56,000 refugees arrived in the United States during fiscal year (FY) 2011 [3]; the largest proportion comprised persons from Burma (30%), Bhutan (27%), Iraq (16%), and Somalia (6%) [3].

Varicella vaccination is not typically provided in refugee camp settings or included as part of the national vaccine schedules in most of the countries hosting refugees. Furthermore, unlike immigrants, U.S.-bound refugees are not required to undergo assessment for evidence of VZV immunity or to receive vaccines recommended by the Advisory Committee on Immunization Practices (ACIP) prior to arrival in the United States [4, 5].

Few published data on VZV seroprevalence among adults in US-bound refugee groups are available; as such, little is known about VZV susceptibility in these populations. We describe VZV seroprevalence in adults in 5 U.S.-bound refugee groups using stored sera specimens. Data on VZV seroprevalence will be useful in guiding recommendations on varicella vaccination for newly arriving groups.

METHODS

Specimens for adults aged 18–45 years were obtained from the Migrant Serum Bank at the Centers for Disease Control and Prevention (CDC) (Atlanta, GA). US-bound refugees and immigrants are required to undergo medical examination overseas prior to departure to identify any conditions of public health concern (such as infectious tuberculosis) that would preclude entry into the United States [4]. The CDC Migrant Serum Bank stores de-identified sera remaining from blood routinely collected during this screening. Data on refugees with available sera are limited to age, gender, nationality, most recent camp or location of residence, and date of serum collection.

We selected 5 groups that represented a large proportion of refugees resettled in the United States in 2011 [3] and that had available sera in the CDC Migrant Serum Bank. These refugee groups included (1) Bhutanese from camps in Damak, Nepal, (2) Burmese from camps on the Thailand-Burma (Myanmar) border, (3) Burmese living in urban areas of Malaysia, (4) Iraqis living in urban areas of Jordan, and (5) Somali refugees living in urban Nairobi and in a camp in Kakuma, located 812 km northwest of Nairobi. We selected specimens from the most recent years of collection for each refugee group.

Detection of VZV immunoglobulin (Ig) G antibodies by VZV IgG enzyme-linked immune-sorbent assay (ELISA) is an indicator of prior VZV infection [6]. VZV IgG may be detectable within the first 4 days of rash or other symptoms and up to years and even decades after clinical symptoms, but without active varicella symptoms, detection of VZV IgG antibodies is likely a reflection of prior VZV infection [7]. Serum samples were tested at the CDC National VZV Laboratory for VZV IgG using an in-house whole-cell ELISA [8]. Per CDC's standard protocol, samples that were negative for VZV by VZV IgG ELISA were retested using a more sensitive glycoprotein IgG ELISA [8].

Data were analyzed using SAS (version 9.2; SAS Institute Inc, Cary, NC). This project was determined by CDC not to require ethical review since it involved use of previously collected specimens without personally identifiable information.

RESULTS

A total of 1,105 specimens collected between 2003 and 2008 were tested [Table 1]. The median age of refugees tested was 30 years (18–45 years); 52% of specimens were from males.

Overall VZV seroprevalence was 97% across all refugee groups (range: 94–99% by refugee group) [Table 2]. Somali refugees in Nairobi, Kenya had the lowest VZV seroprevalence (94%), whereas Bhutanese refugees in Damak, Nepal and Burmese refugees in Kuala Lumpur, Malaysia had the highest seroprevalence (99% in both groups).

Rates of VZV IgG seropositivity were high across all age groups (range: 92–100%) [Table 2]. VZV seroprevalence was ≥92% among 18–26 year-olds and ≥93% among ≥27 year-olds.

DISCUSSION

VZV seroprevalence was ≥90% (range 94%–99%) in all refugee groups tested, even among the younger adults (18–26 years). With little varicella vaccination occurring among US-bound refugees prior to arrival, VZV seropositivity among these refugees likely resulted from natural disease. The VZV seroprevalence found in these 5 US-bound refugee groups from tropical climates was higher than other published estimates of VZV seroprevalence among refugee populations or populations living in tropical climates [1, 2, 9, 10]. The high VZV seroprevalence in groups in this study may be related to occurrence of varicella outbreaks in refugee camps [11]; increased likelihood of transmission due to crowded living conditions in the camps; or increased exposure opportunities due to migration, rather than a reflection of the underlying seroepidemiology in the countries of origin or residence prior to US-arrival. Varicella outbreaks have been reported among US-bound refugees. Between 2004–2007, CDC responded to 19 vaccine-preventable disease outbreaks among US-bound refugees, including varicella [11]. Such outbreaks can lead to postponement of departure while affected individuals recuperate. In some circumstances, CDC has drafted specific, time-limited varicella vaccination recommendations for US-bound refugee groups affected by varicella outbreaks.

One study of Somali refugees who resettled in Minnesota in 1998 found similar findings to seroprevalence rates as in this study, with a VZV-seropositivity of 94% among 18–29 year-olds and 95% seropositive among ≥30 year-olds [12]. However, other previous studies reported lower rates of VZV seropositivity among resettled refugee populations. A study of 58 Burmese refugees from Thailand aged ≥5 years arriving in Canada in 2006 found 88% were VZV-seropositive [10]. In a study of several refugee groups tested who were seen for medical evaluation in 2000–2002, VZV seroprevalence ranged from 70 to 91%, depending on region of origin, with VZV seroprevalence of 71–75% among those from Somalia/East Africa, Afghanistan/Iraq/Iran, and Asia [9]. These findings of lower seroprevalence in these refugee groups is consistent with findings of lower VZV seroprevalence in tropical climates

compared with adults in temperate regions [1, 2]. Some proposed explanations for differences in epidemiology are potential reduction in survival time or transmissibility of the virus in warmer climates, less opportunity for exposure in rural areas, competition with other viral pathogens, or differences in agent, host, and environmental factors [1].

Our study had several limitations. VZV seroprevalence rates in refugee populations may change over time depending on the occurrence of outbreaks and, in situations where refugees reside in camps, on camp composition, as populations may be dynamic. It is not clear the extent to which the seroepidemiology we report reflects that of the refugees' countries of origin, or the location at the time of testing prior to US-arrival. Finally, we were unable to evaluate the VZV seroprevalence of children in these refugee groups since sera from children ≤15 years of age are infrequently collected during the required overseas medical examination.

CONCLUSIONS

Although we reported high VZV seroprevalence in these 5 US-bound refugee populations, data from other studies suggest that there may be a proportion of adult refugees who are susceptible to varicella, and at increased risk of severe disease [1]. Additional studies are needed to assess current VZV seroprevalence in refugee populations to understand their susceptibility to varicella and need for vaccination once resettled in the United States. In the meantime, providers who care for refugees should be aware that VZV epidemiology in these groups may differ from that seen in US-born persons. Providers should assess for evidence of immunity to varicella [13] (documentation of age-appropriate vaccination with varicella vaccine, laboratory evidence of immunity or laboratory confirmation of disease, birth in the United States before 1980, or diagnosis or verification by a health-care provider of a history of varicella or herpes zoster disease) and other vaccine-preventable diseases and vaccinate according to ACIP recommendations [5]. Refugees are a heterogeneous group with various backgrounds and health profiles; therefore, public health messages targeted for refugees should consider differences in language, culture, customs, and health needs.

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Table 1

Number of Sera Specimens by Refugee Group, Location, and Year of Specimen Collection

Refugee Group	Last country of residence	Location	Years Sera Collected	# Sera Specimens	Median Age in years (range)	Males, No. (%)
Bhutanese	Nepal	Damak-area refugee camps	2007–2008	100	31 (18–45)	52 (52)
Burmese	Thailand	Thailand-Burma (Myanmar) border refugee camps	2007	288	31 (18–45)	156 (54)
Burmese	Malaysia	Kuala Lumpur (urban)	2005–2006	142	29 (18–44)	85 (60)
emsp;Iraqi	Jordan	Amman (urban)	2007–2008	287	31 (18–45)	147 (51)
Somali (Bantu ethnicity)	Kenya	Kakuma refugee camp	2003–2004	206	32 (18–45)	92 (45)
emsp;Somali	Kenya	Nairobi (urban)	2005–2006	82	21 (18–45)	44 (54)

Table 2

VZV Seroprevalence by Refugee and Age Group, 2003–2008

Age Group (years)	# VZV IgG Positive Specimens/# Total Specimens	% VZV IgG Positive Specimens (95% CI)
Bhutanese refugees in Damak-area camps, Nepal		
All Ages	99/100	99 (95–100)
18–26	42/42	100 (92–100)
27–35	25/26	96 (80–100)
36–45	32/32	100 (89–100)
Burmese refugees in Thailand-Burma (Myanmar) border		
All Ages	279/288	97 (95–99)
18–26	106/110	96 (93–100)
27–35	90/95	95 (90–99)
36–45	83/83	100 (96–100)
Burmese refugees in Kuala Lumpur, Malaysia		
All Ages	140/142	99 (95–100)
18–26	48/48	100 (93–100)
27–35	74/76	97 (91–100)
36–45	18/18	100 (81–100)
Iraqi refugees in Amman, Jordan		
All Ages	277/287	97 (94–98)
18–26	89/97	92 (84–96)
27–35	105/106	99 (95–100)
36–45	83/84	99 (94–100)
Somali refugees in Kakuma, Kenya		
All Ages	197/206	96 (92–98)
18–26	66/69	96 (88–99)
27–35	64/69	93 (84–98)
36–45	67/68	99 (92–100)
Somali refugees in Nairobi, Kenya		
All Ages	77/82	94 (86–98)
18–26	52/56	93 (83–98)
27–35	6/6	100 (54–100)
36–45	19/20	95 (75–100)