Surveillance of Travel-Related Mosquito-borne Illness in Rhode Island

NEHA ALANG, MD; JUSTIN GLAVIS-BLOOM, MD; NICOLE ALEXANDER-SCOTT, MD, MPH; LEONARD A. MERMEL, DO, ScM; MARIA D. MILENO, MD

ABSTRACT

Malaria and Dengue are some of the common infections occurring in persons traveling to countries endemic for these infections. Chinkungunya virus infection is another illness that can occur in people who have travelled to areas endemic for chikungunya virus infection. Herein we report cases of malaria, dengue, and chikungunya in Newport Hospital, The Miriam Hospital and Rhode Island Hospital between January 1, 2010 and December 31, 2014.

KEYWORDS: Travel-related infections, local transmission, mosquito-borne infections

INTRODUCTION

Approximately 1,500 to 2,000 cases of malaria are reported yearly in the United States, almost all in recent travelers (1). Although dengue rarely occurs in the continental United States, it is endemic in Puerto Rico and in many popular tourist destinations in the Caribbean, Latin America, Southeast Asia and the Pacific Islands (2). Beginning in 2014, cases of chikungunya virus infection were reported among U.S. travelers returning from affected areas in the Americas and local transmission was identified in Florida, Puerto Rico, and the U.S. Virgin Islands (3). With a large number of foreign-born individuals in Rhode Island (13.1%) (4), herein we report cases of malaria, dengue, and chikungunya in our hospital system between January 1, 2010 and December 31, 2014.

METHODS

After Institutional Review Board approval, a list of patients diagnosed with malaria, dengue, or chikungunya between January 1, 2010 and December 31, 2014 at Newport Hospital, The Miriam Hospital and Rhode Island Hospital was obtained using the Theradoc software program in the Rhode Island Hospital Department of Epidemiology and Infection Control. Once these patients were identified, their medical records were reviewed to assess details regarding their acute illness.

RESULTS

Of 35 identified cases, 51% were reported in 2014 (**Figure 1**). We identified 23 cases of malaria, 22 caused by Plasmodium falciparum and one by P. vivax/ovale. All cases were diagnosed by thick and thin smears (**Table 1**). The majority of cases had recent travel to Africa. All cases of P. falciparum were hospitalized; 16 were treated with atovaquone and proguanil, 2 with quinine sulphate and clindamycin, 2 with quinine sulphate and doxycycline, 1 with chloroquine, and 1 with atovaquone, proguanil and doxycycline. The time interval from return to the U.S. until diagnosis of malaria ranged from 2 to 30 days. The one case of P. vivax/ovale occurred in a patient who had traveled to Ethiopia seven months earlier. This patient was hospitalized and treated with mefloquine.

Figure 1. Travel-related infection diagnosis at time of diagnosis

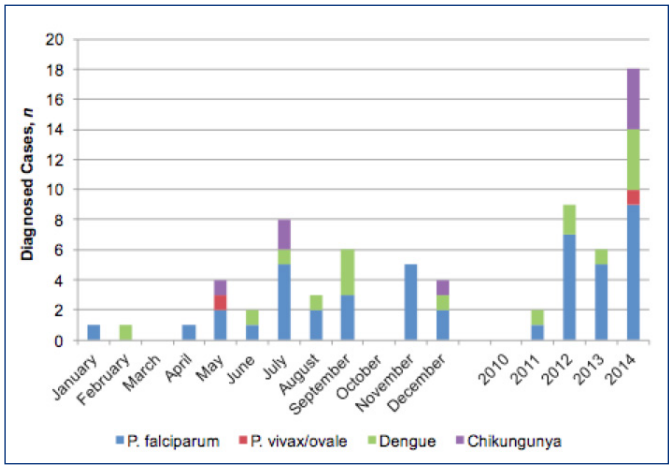

Table 1. Demographics of patients with travel-related infections

	Malaria	Dengue	Chikungunya
Total Cases	23	8	4
Age ± SD (years)	38 ± 21	22 ± 18	36 ± 22
Gender, n (%)			
Male	12 (52%)	7 (87.5%)	2 (50%)
Female	11 (48%)	1 (12.5%)	2 (50%)
Country of recent travel, n (%)			
Nigeria	6 (26%)		
Dominican Republic		5 (62.5%)	2 (50%)
Liberia	5 (22%)		
Haiti	1 (4%)		1 (25%)
Guinea	2 (9%)		
Other	9 (39%)	3 (37.5%)	1 (25%)

There were 8 cases of dengue, all diagnosed by serology. One had past dengue infection, 1 had probable past infection, 2 had equivocal values for IgG and IgM, 2 had elevated IgM levels, and 2 had elevated IgG and IgM levels. Most cases had recent travel to the Dominican Republic. Six of the 8 cases were hospitalized. The time interval from return to the US until diagnosis of dengue was 7 to 45 days.

Four cases of chikungunya were diagnosed; all were diagnosed serologically. The time interval from return to the United States until diagnosis of chikungunya was 8 to 45 days.

DISCUSSION

Most of the cases reported herein were detected in 2014. This may indicate greater awareness of these diagnoses among practicing physicians, greater incidence of these diseases in endemic countries visited by our patient population, or additional, unknown reasons. Although the male to female ratio was similar in cases of malaria and chikungunya, there was a strong male preponderance with dengue diagnosed in our hospital system, as previously reported (2). Most dengue cases reported travel to the Dominican Republic in September, coinciding with the rainy season.

Some of the limitations of this study reflect the fact that chikungunya is not a reportable disease to the Rhode Island Department of Health and it may be underreported in this study. Data from only 3 hospitals were collected. Data on whether the patients infected with malaria were using anti-malarials was not collected. Data on how many of the people infected with malaria were visiting Africa for medical reasons (teaching, research, etc.) was not studied.

Chikungunya virus is most often transmitted by the *Aedes aegypti* and *Aedes albopictus* mosquitoes, which are the same species that transmit dengue virus (5). These mosquitoes are found throughout much of the Americas, including parts of the Southern US. Since chikungunya is new to the Americas, most people in the region are not immune and infected travelers could spread the virus to mosquitoes upon their return home, leading to local transmission and further infections (6) as in infrequent reports of autochthonous cases of chikungunya and dengue in the US (7). Although most cases of chikungunya infection are self-limited, chronic arthritis affects a small number of infected cases (8). Our experience suggests that these patients' symptoms can wax and wane and may present with joint pain weeks after their initial onset of symptoms leading to an extended period of time from infection to diagnosis.

In conclusion, of the approximately one million people residing in Rhode Island, we identified 35 cases of malaria, dengue or chikungunya over five years with the largest number of cases identified in 2014. Travelers returning from areas with mosquito-borne infections, including dengue, chikungunya and Zika virus, are recommended to take steps to prevent mosquito bites for 3 weeks to prevent local transmission (9). We believe that by making travelers aware of mosquito-borne infections and reducing their risk by use of insect repellents, mosquito netting, screened windows and access to a pre-departure travel clinic would reduce the risk of these and other travel-related illnesses in our patient population. Nevertheless, it is likely that we will see greater numbers of these infections in our state based on the large number of people who vacation or have families in the Caribbean.

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Authors

Neha Alang, MD, Department of Internal Medicine, Newport Hospital.

Justin Glavis-Bloom, MD, Warren Alpert Medical School of Brown University.

Nicole Alexander-Scott, MD, MPH, Director, Rhode Island Department of Health.

Leonard A. Mermel, DO, ScM, Professor of Medicine, Warren Alpert Medical School of Brown University.

Maria D. Mileno, MD, Associate Professor of Medicine, Warren Alpert Medical School of Brown University.

Correspondence

Neha Alang, MD
Division of Hospital Medicine,
Newport Hospital
11 Friendship Street
Newport, RI 02840
401-845-1281
neha_alang@hotmail.com