Variables Impacting Dengue Surveillance in Key West Florida

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Abstract

Objective: To evaluate barriers to dengue reporting, as well as the patient-level factors that may limit the identification of dengue cases through passive surveillance in Key West, Florida.

Methods: Cross-sectional surveys were administered to 400 households across Key West and Stock Island. Subjects were asked if they had recent symptoms consistent with dengue, whether they sought medical care, and if they would seek medical care for a high fever

Results: Patient-level factors that influenced the decision to seek medical care for a high fever were: having a specific doctor call when sick (p<0.006), health insurance status (p<0.037), and ethnicity (p<0.005). The most significant barriers to dengue reporting were the decision to seek medical care for symptoms consistent with dengue fever, and the doctor's decision to administer confirmatory dengue laboratory tests. No one in the United States received a laboratory test, although four individuals met the current WHO clinical case definition.

Conclusion: This study shows that patients and doctors in Key West underestimate the potential for dengue when there are symptoms consistent with the disease.

Introduction

Dengue fever is the most common mosquito borne viral disease in the world. Symptoms of the illness range from fever, rash, and muscle stiffness, to life threatening hemorrhagic shock. In 2009/2010 Key West experienced the largest identified outbreak of dengue in the continental United States in the last 50 years. Historically, the emergence of diseases like dengue into new geographic areas is identified through passive surveillance systems. At each step in the process of passive surveillance, positive cases may be missed. This will be the first study concerning dengue that attempts to evaluate limitations to passive surveillance, at the levels of both the patient and physician, in Key West, FL. Understanding the likelihood of our current system's ability to detect dengue emergence is a critical aspect in preparedness and planning for outbreaks. Recognition of these impediments can facilitate reduction of dengue transmission in this area and prevent a future epidemic from occurring.

Figure 1: Steps in Passive Surveillance
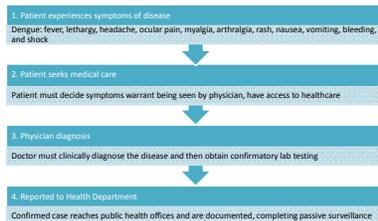
Methods

A cross-sectional survey of 400 randomly selected households in Key West was administered. Specific questions were asked concerning recent clinical symptoms consistent with dengue, patients' healthcare seeking behaviors, access to medical care, familiarity with the disease, and demographics of the community participants. Univariable analyses were conducted on all survey variables to include a description of frequencies and odds ratios for categorical variables. Comparisons between responses were conducted using chi-square (categorical/bivariate variables) or t-tests (continuous variables). Logistic regressions were conducted to determine the relative odds of seeking medical care by patient demographics and other factors of interest.

Results

Table 1: Decision to seek medical care for a high fever according to patient demographics

| Patient Demographics	Would seek medical care for fever > 102 N (%)	Would not seek medical care for fever > 102 N (%)	Chi square P-value N = 400
Sex			0.67
Male	151 (46.6)	32 (43.8)	
Female	173 (53.4)	41 (56.2)	
Age			0.28
1-25 years	40 (12.7)	8 (11.1)	
26-50 years	103 (32.7)	24 (33.3)	
51-75 years	137 (43.5)	37 (51.4)	
76-100 years	35 (11.1)	3 (4.2)	
Ethnicity			0.005
White	196 (61.8)	45 (61.6)	
African American	30 (9.5)	4 (5.5)	
Hispanic/Latino	77 (24.3)	13 (17.8)	
Other	14 (4.4)	11 (15.1)	
Primary Language			0.39
English	290 (91.2)	63 (88.7)	
Spanish	20 (6.3)	4 (5.6)	
Other	8 (2.5)	4 (5.6)	
Income			0.21
<$35,000	39 (12.0)	15 (20.3)	
$35-49,999	27 (8.3)	4 (5.4)	
$50-74,999	44 (13.5)	8 (10.8)	
$75-99,000	27 (8.3)	10 (13.5)	
$100,000+	58 (17.8)	14 (18.9)	
Declined	131 (40.2)	23 (31.1)	
Education Level			0.13
Graduate/professional Degree	51 (16.1)	12 (16.4)	
Bachelor's or Associates	98 (31.0)	28 (38.4)	
Some College/high school graduate	138 (43.7)	32 (43.8)	
Some education, no high school degree	29 (9.2)	1 (1.4)	
Area of Key West			0.20
Old Town	127 (39.0)	26 (35.1)	
Mid Town	52 (16.0)	9 (12.2)	
New Town	96 (29.5)	31 (41.9)	
Stock Island	51 (15.6)	8 (10.8)	

To determine healthcare seeking behavior, we asked Key West residents if they would seek medical care for a fever greater than 102F. This was a symptom consistent with dengue, but one that was also non-specific and familiar enough to patients that they could make an educated response. Overall 81% of participants would seek care for a high fever. We then stratified answers according to patient demographics. Of these, only ethnicity had a statistically significant impact (p < 0.005).

Table 2: Decision to seek medical care for a high fever based on access to healthcare and perception of disease

| Patient factors of interest	Would seek medical care for fever >102 N (%)	Would not seek medical care for fever >102 N (%)	Chi square P-value
Has a specific doctor to call when sick	211 (65.1)	35 (48.0)	0.006
Health Insurance status			0.037
Public	85 (26.7)	13 (18.1)	
Private	142 (44.7)	30 (41.7)	
Both	32 (10.0)	5 (6.9)	
None	59 (18.6)	24 (33.3)	
Years spent in Key West			0.49
<1 year	19 (6.1)	5 (6.9)	
1-5 years	56 (17.9)	10 (13.9)	
5+ years	145 (46.3)	40 (55.6)	
Lifelong resident	93 (29.7)	17 (23.6)	
Dengue Knowledge			
No knowledge prior to interview	168 (51.5)	42 (56.8)	0.42
Has heard of Dengue	85 (53.1)	16 (50.0)	0.75
Has known someone personally with Dengue	73 (29.4)	21 (37.5)	0.24
Can name at least 3 Symptoms of Dengue	39 (15.5)	6 (10.5)	0.33
How serious a problem is Dengue for the Florida Keys on a scale of 1-5			0.21
1. Not at all serious	43 (17.8)	9 (16.7)	
2. Slightly serious	57 (23.6)	18 (33.3)	
3. Somewhat serious	60 (24.8)	17 (31.5)	
4. Very serious	42 (17.4)	5 (9.3)	
5. Extremely serious	40 (16.5)	5 (9.3)	
Patient perception of likelihood they/someone in their family will get Dengue in lifetime			0.26
Very likely: >80% chance	14 (5.9)	4 (7.3)	
Somewhat likely: 51-80% chance	11 (4.6)	1 (1.8)	
Equally likely/unlikely: 50% chance	40 (16.7)	6 (10.9)	
Somewhat unlikely: 10-49% chance	67 (28.0)	11 (20.0)	
Very unlikely: <10% chance	107 (44.8)	33 (60.0)	

The decision to seek medical care for a high fever was also analyzed according to a variety of other patient factors. The two statistically significant variables were health insurance status (p < 0.037) and having a specific doctor to call when sick (p < 0.006). Interestingly, years spent in Key West, dengue knowledge, and the perception of its seriousness/prevalence did not influence the decision to seek medical care.

Figure 2: Healthcare providers used by Key West locals experiencing symptoms consistent with Dengue Fever.
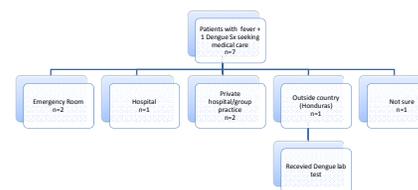
Note that the only person to receive laboratory testing was in Honduras during the workup. The 7 people in this sample had symptoms consistent with the 1997 dengue case definition, but only 4 meet the current 2009 WHO case definition (fever plus 2 of the following: nausea, vomiting, rash, aches & pains, leukopenia, positive tourniquet test).

Figure 1: Distribution of persons receiving medical care and laboratory testing for symptoms consistent with Dengue Fever.
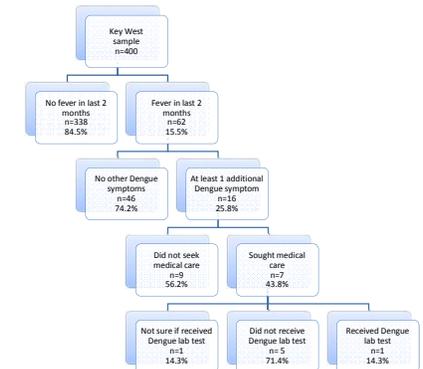
A view of the current system's efficacy in diagnosing cases and reporting disease. Of the 16 people who had both a high fever and an additional dengue symptom, only seven (43.8%) participants sought medical care for their symptoms, and of these seven only one (14.3%) received confirmatory laboratory testing. *Additional Dengue symptoms included: eye pain, headache, body ache, bleeding, and rash.

Discussion and Conclusions

Reporting of dengue cases occurs after they have been confirmed by laboratory testing. In our study, none of the patients who presented for symptoms consistent with dengue received testing in the US. There are likely cases going unreported because they have not been established with the appropriate serologic tests.

Four patients in our sample met the current case definition for dengue, yet none were clinically diagnosed with the disease. This suggests that dengue is not high on local physicians' differential for these symptoms, which is a barrier to passive surveillance.

Patients can also be responsible for passive surveillance breakdowns. If a patient has symptoms consistent with dengue, then they need to decide to seek medical care so a doctor may diagnose it. Patient demographics can affect the decision to seek medical care. In this study, ethnicity, health insurance status, and having a specific doctor to call when sick caused a significant difference in patient response.

Acknowledgements