

CORRESPONDENCE

Mapping chikungunya fever in municipalities of one coastal department of Colombia (Sucre) using geographic information system (GIS) during 2014 outbreak: Implications for travel advice

**KEYWORDS**

Chikungunya;
Epidemiology;
Travelers;
Colombia;
Latin America

Chikungunya (CHIKV) fever has emerged in 2014 as one of the most significant tropical infectious diseases in Latin America, given its high transmissibility due to the extended presence of its main vector *Aedes aegypti* in the region [1]. Travelers to endemic areas in Latin American countries should be aware about the risk of infective biting exposure when visiting for different purposes these areas. In order to help in the advice to travelers, epidemiological information is of utmost importance [2,3], including the availability of detailed maps in order to assess the risk when visiting specific destinations [3]. For these reasons, we have developed among the first published epidemiological maps for CHIKV in Colombia using geographical information systems (GIS) at one of the departments (Sucre) located in one of the main touristic regions of the country (Caribbean coast region).

Use of GIS for development of epidemiological maps in chikungunya (CHIKV) has not been yet used in Colombia and Latin America, particularly at the north Caribbean coastal areas of Colombia, e.g. Sucre department, which have been significantly affected by the 2014 Americas outbreak.

Surveillance cases data (2014) (official reported by the National Institute of Health of Colombia) were used to estimate annual incidence rates using reference population data, on CHIKV infections (cases/100,000 pop) and to develop the first map in the municipalities of Sucre. GIS used was Kosmo[®] 3.1.

During 2014, 14,741 cases of CHIKV were reported in Sucre, for cumulated rates of 1748.26 cases/100,000 pop

(1.75%). Rates ranged from 0 to 3239.74 cases/100,000pop. Highest incidence was reported at Palmitos municipality (6092.20 cases/100,000pop; 6.09%), followed by Ovejas (4658.97 cases/100,000pop; 4.66%), Sincé [San Luis de Sincé] (3863.79 cases/100,000pop; 3.86%), Tolú [Santiago de Tolú] (3764.02 cases/100,000pop; 3.76%), Sincelejo (capital of the department) (2708.26 cases/100,000pop; 2.71%) and Corozal (2179.35 cases/100,000pop; 2.18%) (Fig. 1). These six municipalities (out of 26), reported 88.4% of cases of the department (Table 1).

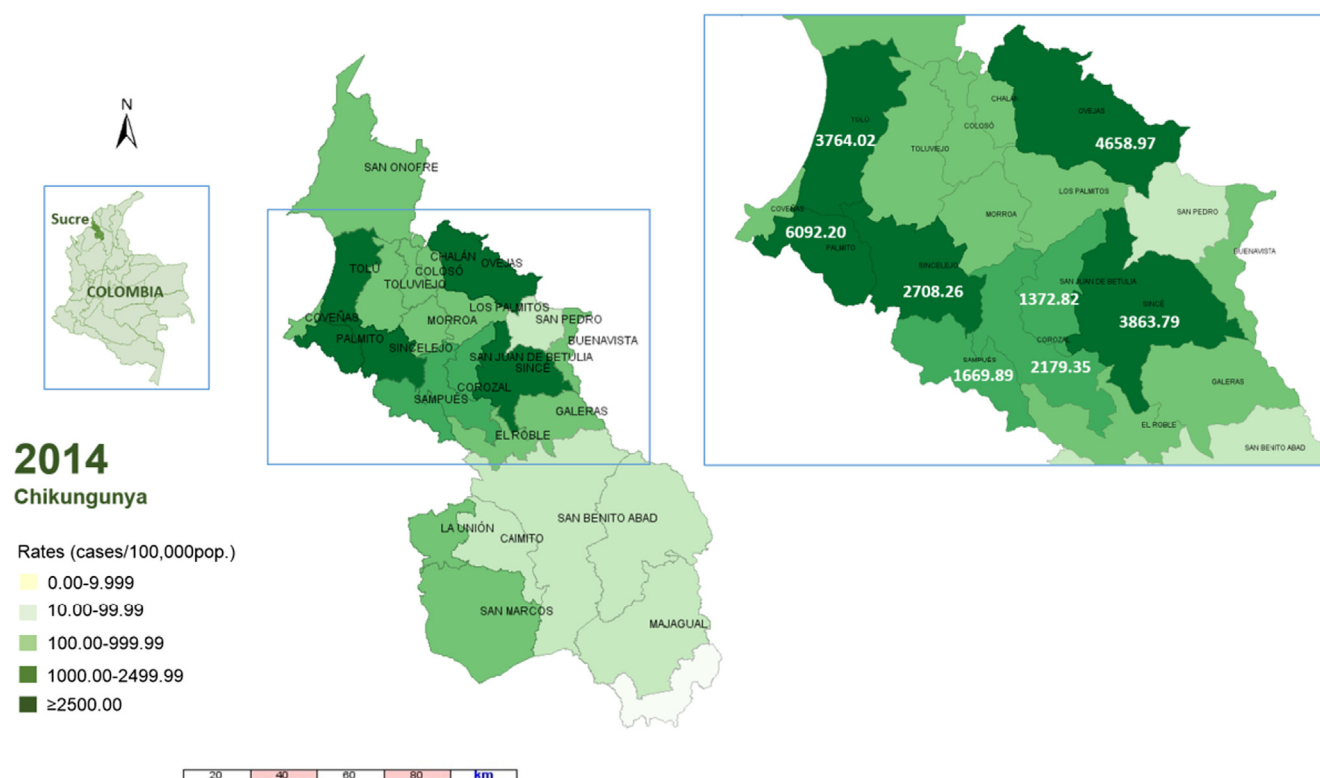
Colombia officially reported during 2014, a total of 106,592 cases; 13.8% were from Sucre department. This positioned it as the second department with highest incidence of CHIKV, after Norte de Santander (1837.33 cases/100,000pop). At Sucre, burden of CHIKV infection was concentrated in the north of the department, at two main ecological hotspots: west (Tolú-Palmito-Sincelejo) and east (Ovejas-Since), with rates ≥ 2500 cases/100,000pop, but surrounded by municipalities with incidences between 1000 a 2499.99 cases/100,000pop (Sampues, Corozal, San Juan de Betulia) (Fig. 1). Given the ecoepidemiological conditions of the department and particularly of these municipalities, these are becoming now endemic for CHIKV. Then public health policies and strategies for integral control of CHIKV in people living, but also in travelers, in these areas, should be considered and urgently implemented [4]. Even more, up to epidemiological week 14 (april 2015) Colombia reported so far 176,196 cases with 3.48% from Sucre (6126 cases).

Although CHIKV was first isolated in 1952, only after 2005 outbreak in La Reunion, significant research has been done regard it, but not yet enough in Latin America and in Colombia [5]. For example, we do not have yet information about the genotype/lineage of CHIKV that is circulating in the country. An Asian-lineage CHIKV strain was introduced into the island of St. Martin in October 2013, and is believed that this subsequently spread to the rest of the Caribbean and Latin America [6,7].

Use of GIS-based epidemiological maps allow to integrate preventive and control strategies, as well public health policies, for joint control of this vector-borne disease in this area of the country. As CHIKV is transmitted primarily by *A. aegypti*, the dengue virus vector, maps of both infections as well for coinfections will be also needed. Finally also providing relevant information in order to

Table 1 CHIKV incidence rates (cases/100,000pop) by municipalities in Sucre department, Colombia, 2014.

Municipalities	Cases (2014)	% Cumulated	Population (2014)	Rates (cases/100,000pop)
Whole department	14,741	100.00	843,182	1748.26
Palmito	818	5.55	13,427	6092.20
Ovejas	985	12.23	21,142	4658.97
Sincé	1289	20.98	33,361	3863.79
Tolú	1232	29.33	32,731	3764.02
Sincelejo	7349	79.19	271,355	2708.26
Corozal	1351	88.35	61,991	2179.35
Sampues	631	92.63	37,787	1669.89
San Juan de Betulia	172	93.80	12,529	1372.82
Coveñas	105	94.51	13,300	789.47
La Unión	87	95.10	11,073	785.69
Los Palmitos	140	96.05	19,276	726.29
Buenavista	69	96.52	9502	726.16
Tolú Viejo	109	97.26	18,900	576.72
El Roble	44	97.56	10,432	421.78
Morroa	50	97.90	14,263	350.56
San Onofre	149	98.91	49,784	299.29
Coloso	16	99.02	5878	272.20
Chalán	11	99.09	4341	253.40
San Marcos	68	99.55	56,384	120.60
Galerías	20	99.69	19,866	100.67
Majagual	19	99.82	33,077	57.44
San Pedro	8	99.87	16,075	49.77
Sucre municipality	10	99.94	22,374	44.69
Caimito	2	99.95	11,962	16.72
San Benito Abad	3	99.97	25,171	11.92
Guaranda	1	99.98	17,201	5.81
Unknown	3	100.00	—	—

**Fig. 1** Geographic distribution of CHIKV incidence rates (cases/100,000pop) in Sucre department, Colombia, 2014.

assess the risk of travelers with specific destination in highly transmission areas with the idea of giving prevention advice [8], even more because they play also an important role in the virus spread, as occurs in Colombia and its Sucre department in 2014 [4].

Conflicts of interests

The authors state that they have no conflicts of interest.

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