Short Communication

Dengue in Brazil and Colombia: a study of knowledge, attitudes, and practices

Solange Laurentino dos Santos[1], **Gabriel Parra-Henao**[2], **Mírcia Betânia Costa e Silva**[1]
and Lia Giraldo da Silva Augusto[3]

[1]. Departamento de Medicina Social, Universidade Federal de Pernambuco, Recife, PE. [2]. Grupo de Epidemiologia y Bioestadistica, Universidad CES, Medellín, Colômbia. [3]. Faculdade de Ciências Médicas, Universidade de Pernambuco, Recife, PE.

ABSTRACT

Introduction: This study was conducted in Brazil and Colombia,where dengue is endemic and vector control programs use chemical insecticides. **Methods**: We identified knowledge, attitudes, and practices about dengue and determined the infestation levels of *Aedes aegypti* in one Brazilian and four Colombian communities. **Results:** The surveys show knowledge of the vector, but little knowledge about diagnosis, prognosis, and treatment. Vector infestation indices show Brazil to have good relative control, while Colombia presents a high transmission risk. **Conclusions**: Given the multidimensionality of dengue control, vertical control strategies are inadequate because they deny contextualized methods, alternative solutions, and local empowerment.

Keywords: Dengue. Knowledge. Practices. Brazil. Colombia.

Four types of dengue virus (DENV) circulate in Latin America, with six countries including Brazil and Colombia having DENV 1, 2, 3, and 4. Up to epidemiological week 36 of 2012, Brazil had the highest incidence with 248/100,000, while Colombia represented an incidence of 157/100,000. During this period, Braziland Colombia had 130 (36%) and 36 (15%) deaths, respectively, out of the Latin American total mortality of 376[1].

Brazil's population is 190,732,694, distributed in 5,565 municipalities[2]. Dengue is endemic with recurrent epidemic outbreaks. Ten out of 27 states had 81.6% (233,488) of cases reported in the first trimester of 2012[3]. In Brazil, the Program for Eradication of *Aedes aegypti* began in 1950, but in 1985 the focus was modified to control. In 1996, Brazil regressed to a model of eradication, and the National Plan for Eradication of *Ae. Aegypti*[4] was implanted in 3,701 municipalities. In 2002, DENV 3 was introduced, leading to an emergency National Plan for Dengue Control [*Programa Nacional de Controle da Dengue* (PNCD)][5], a permanent program in all municipalities. In 2012, Brazil purchased 2.5 million kg of larvicide and 350 million L of adulticide[3].

In Colombia, a country with a population of 46,722,777 distributed in 1,103 municipalities, the disease has become endemic with frequent outbreaks[6]. Six of 32municipalities showed 55.36% (20,394) of the cases of the first nine months of 2012. Currently all four serotypes circulate throughout the country[7]. A campaign to eradicate *Ae. aegypti* began in the early 1950s, and the country was said to be free of infestation by 1952. Columbia's Ministry of Health (MoH) operates under the National Plan of Basic Attention Beginning in 2006, the MoH adopted a national integrated control strategy with inter-sectorial, multidisciplinary, and community participation and a vector control program based mainly on the use of insecticides.

We compared levels of consciousness and conduct in one Brazilian and four Colombian communities. These field studies were realized in two stages: I) An entomological survey using the House Index and Breteau Index. In Brazil this survey was done bimonthly over one year (2008); in Colombia, this survey was conducted at three times, time zero (TO), time one (T1), and time two last intervention (T2), from 2008-2010; II) A survey of knowledge, attitudes, and practices of a sample of residents, using a standardized household survey about knowledge of the disease, activities of prevention, and control of vectors, water supply, sanitation, and home reservoirs in Latin America.

The Brazilian study site was the neighborhood Santa Rosa in the municipality of Cabo de Santo Agostinho, State of Pernambuco, which is a tourist and port complex of 448 square km with a population of 152,997, 87.9% of whom are urbanized, and with relative socioeconomic homogeneity. Its 813 domiciles manifest a 50% dengue incidence with a ± 5% confidence interval based on a 263-domicile sample[2]. The N=263/813 households were calculated with an estimated 50% incidence at a ± 5% error interval. The study covered 852 persons, with a mean of four persons per domicile, and the study period was 2007-2009. In Colombia, four neighborhoods in the municipalities of Apartado (La Alborada and La Arboleda) and Carepa (Obrera and Cadena) in Antioquia State were chosen

Address to: Dra. Solange Laurentino dos Santos. Depto. de Medicina Social/ UFPE. Av. da Engenharia s/n, Cidade Universitária, 50740-600 Recife, PE, Brasil.
Phone: 55 81 2126-8550; **Fax:** 55 81 2126-8558
e-mail: solange.lsantos@ufpe.br

for their high dengue incidence. Situated on the Caribbean coast, the municipality of Apartado has an area of 600 square km, of which 5.65km^2 are urban with 114,840 inhabitants[6]. The municipality of Carepa is 380 square km, of which 3.2 square km are urban. Neighborhoods were chosen for their 50% dengue incidence with ± 5% error. The N = 200/422 households were calculated with a 50% incidence at a ± 5% error interval. The four neighborhoods were studied from 2008-2010.

The results show the vector infestation indices to have good relative control in the municipality in Brazil, while the municipalities in Colombia present a high transmission risk. In Santa Rosa in six cycles of 2008, the House Index ranged between 1.28 and 0.47% March and December, while in Colombia the average index average varied from 55.2 to 22.5 to 37.6% infestation in the three time samples, showing that infestation was increasing. See **Figure 1** for the House Index and Breteau Index in Brazil and **Figure 2** for the House Index in Colombia.

Our surveys show knowledge of the vector and its anthropophilic habits but little knowledge about diagnosis, prognosis, and treatment or home care of infected persons. Our results regarding knowledge, attitudes, and practice in the two countries is presented in **Table 1.** These results are to be expected as the mass media campaigns and community

agents focus on reservoir management and spraying. In both countries, people realize that dengue is a serious condition that can kill, but do not know about mechanical prevention beyond vector control (window screens, bed nets, etc.) or the signs and symptoms of the illness.

During the investigation, it was observed in Brazil that Environmental Health Agents initiated local control programs, including the application of temephos (Abate) in home water reservoirs for larval control, despite studies showing possible resistance since 1991 and the indication for integration of biological and chemical insecticides to control mosquito larvae[8]. It was also observed that the Brazilian community is better organized than its Colombian counterparts, with paved streets and public sanitation. In the discussion of the results, we consider that the Brazilian control campaigns use intense and expensive (R$1 billion per year)[9] mass media coverage and social mobilization, while in Colombia less social mobilization and media coverage is observed.

Despite some methodological differences in the study applied in the two countries, the comparative contextual analyses show how different levels of public sanitation and urbanization influence dengue vector infestation, income, and public health. In Brazil, despite R$1 billion spent in 2002[9],
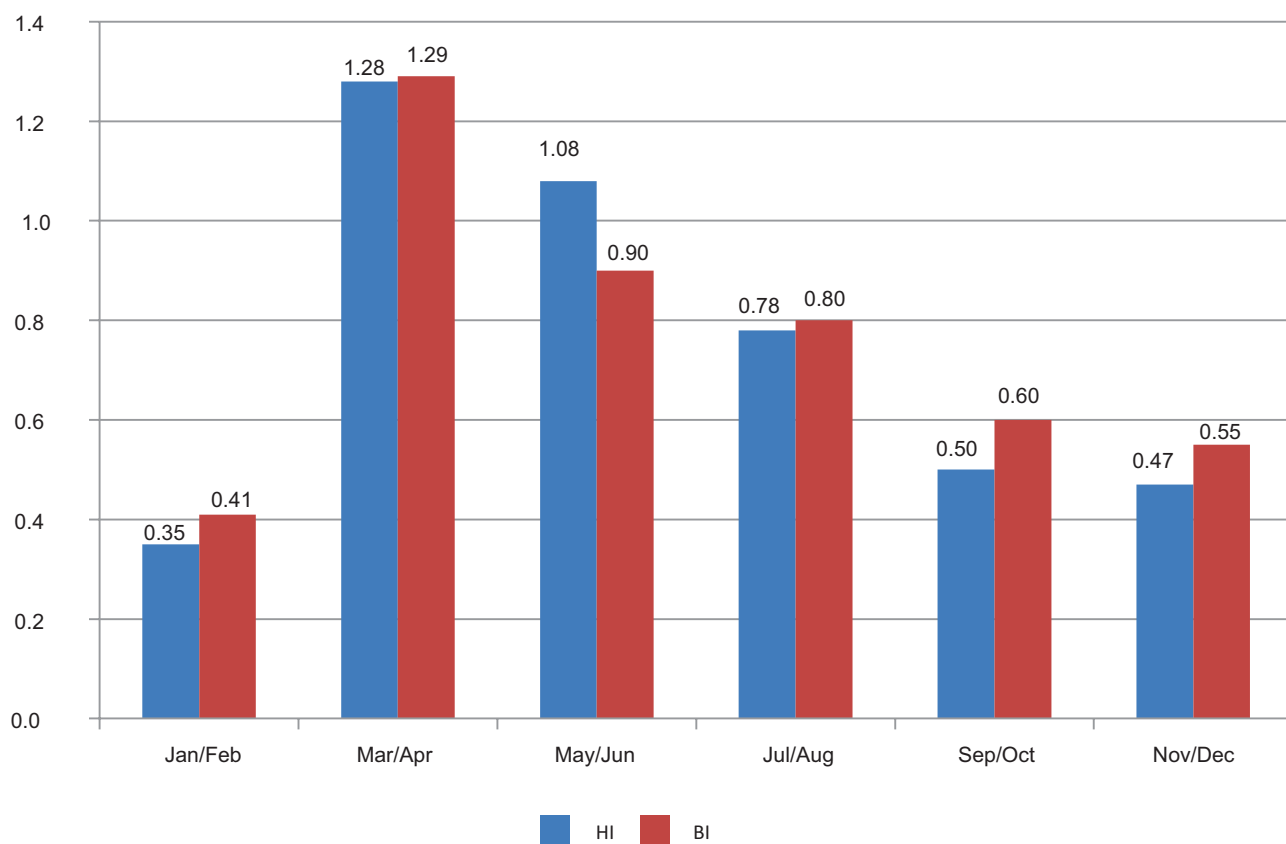
FIGURE 1 - House Index and Breteau Index by bimonthly cycle in Santa Rosa Brazil, 2008. Source: Field study in Santa Rosa, Cabo de Santo Agostinho, State of Pernambuco, 2007-2009. **HI**: House Index; **BI:** Breteau Index.
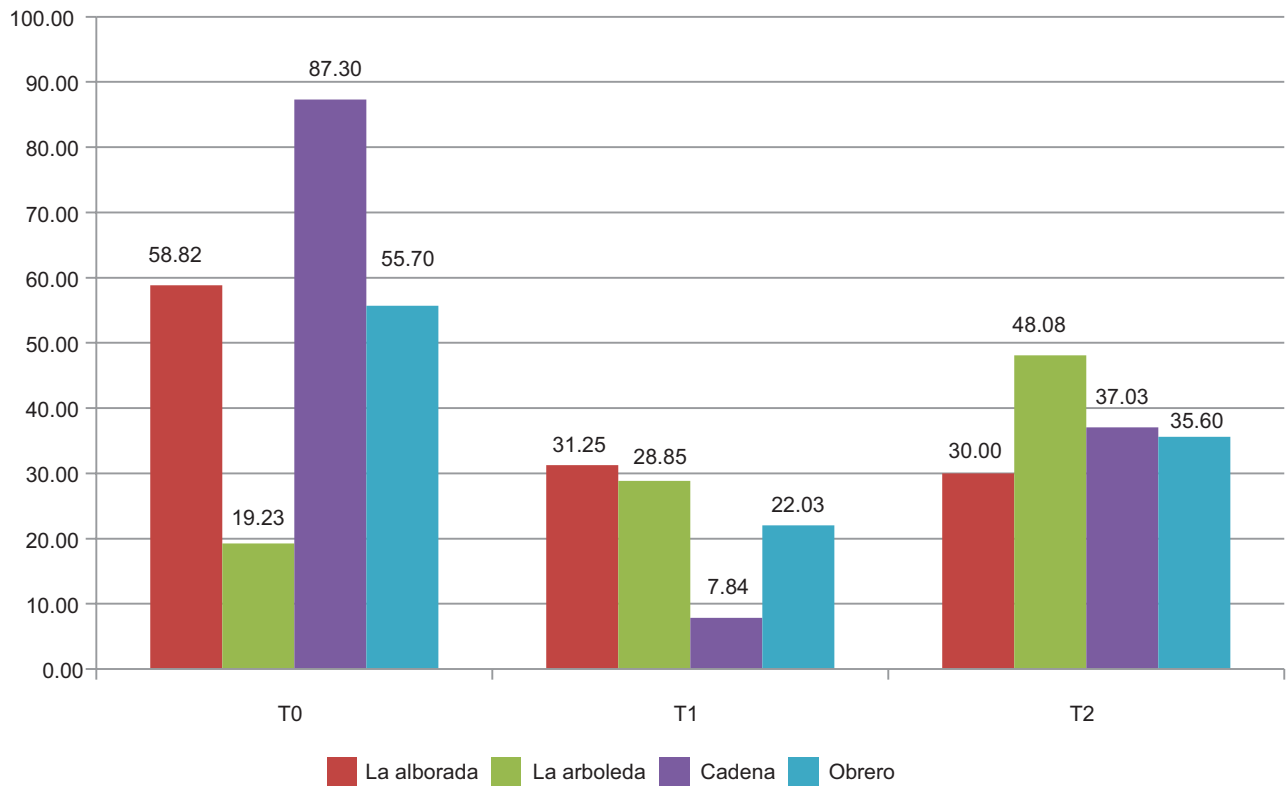
FIGURE 2 - House Index scores in the neighborhoods of La Alborada, La Arboleda, Cadena, and Obrero, Colombia, 2008-2010. Source: Field study in Colombia, 2008-2010. **T0:** time zero; **T1**: time one; **T2**: time two.

85% of which was dedicated to vector control, a 2005 PNCD study showed the low effectiveness of this expensive strategy[10].

Colombia's politically verticalized and chemical-dependent model, like Brazil's, needs to incorporate long-term strategies to abate socio-environmental vulnerability. Unsatisfactory knowledge, attitudes, and practice at the population level are related to heightened risk of transmission and can only be overcome with education and social mobilization adapted to local cultural and linguistic contexts, which are richly diverse in all countries in Latin America. Another study in Colombia showed that after an education intervention in schoolchildren, the knowledge about vector control measures increased from 65.2% to 82.6%[11]. Dengue has a low lethality of about 2.5% with proper clinical attention[12], but in poor communities it is crucial that population education about environmental signs of risk, symptoms, and treatment with good clinical practice be applied to reduce morbidity and mortality.

In 147 Brazilian municipalities with verified resistance to temephos, the population of *Ae. aegypti* showed mortality under 80%; alternatively, the ratio of resistance to a 95% lethal dose (RR95) was greater than 3.0[13]. Brazil has changed to the use of diflubenzuron, and Colombia (at least in the study communities) has adopted *Bacillus thuringiensis israelensis*. In Colombia, there are few reports of resistance in *Ae. aegypti* populations, and the control methods seem to be working[14].

Fieldwork that is participatory, multidisciplinary, and local, like that developed in this and other related articles[15] is necessary to understand and correct attitudes and interactions between persons and health care institutions; to incentivize popular mobilization and participation in micro-environmental management, prevention, and patient care; and to lower the spread of dengue serotypes and fatalities.

The differences between Brazil and Colombia in the index of infestation are marked. In Brazil, vectorial infestation was controlled at levels below two percent, with a declining tendency during the study years, even considering the seasonality of the vector. In the Colombian cities, there was a dramatically high infestation in the cycles monitored during the study, as in the Cadena neighborhood with infestation varying from 87.3 to 7.84 to 37.03% in the three annual cycles.

TABLE 1 - Survey results of knowledge, attitudes, and practice regarding dengue and its vector, individual control measures, insecticide, and water management in Brazil and Colombia.

Survey country	Brazil (n = 263)	Colombia (n = 200)	
	Cabo Santo Agostinho	Apartado	Carepa
	Santa Rosa	La Alborada e La Arboleda	Obrero e Cadena
Knowledge			
How dengue is transmitted? (n; %)	report by mosquitoes (259; 98.5)	report by mosquitoes (158; 79.0)	
Do you know the mosquito types that transmit dengue? (n; %)	know the mosquito types (233; 88.6) confuse *Aedes Aegypti* with *Culex quinquefasciatus* (79; 30.0)	know the mosquito types (176; 88.0) confuse with *Tipulidae* gender Tipula (105; 52.5)	
How serious is dengue? (n; %)	report that dengue kills (255; 96.9)	report that dengue kills (192; 96.0)	
How can dengue be prevented? (n; %)	report that dengue can be prevented with vector control (236; 89.7) report that dengue can be prevented through patient care (3; 1.1)	report no response (100; 50.0) report that dengue can be prevented by medical treatment (59; 29.5)	
What collective precautions should the patient take with dengue? (n; %)	report water management (82; 31.2) report better trash collection (50;19.0) do not know (45; 17.1)	do not know (100; 50.0) report mosquito control (30; 15.0) report disposal of washing water reservoirs (34; 17.0)	
Individual means of prevention (n; %)	report individual action (236; 89.7) report domestic water protection (82; 31.2)	report reservoir protection (100; 50.0) report using larvicides in water and domestic reservoirs (100; 50.0)	
On insecticide use (n; %)	report it can be bad for health (132; 50.2) report the community agent puts chemical larvicide in the water (228; 86.7) report no use of insecticide to kill adult insects (165; 62.7) report that insecticides are chemical products that can be affect health (116; 44.1) do not know the difference between biological and chemical control (216; 82.1)	report chemical prevention (20; 10.0) report no health problems (200; 100.0)	
Attitudes and practices			
Preventing the illness (n; %)	report taking care of water reservoirs (108; 41.1)	report calling the doctor (4; 2.0) report controlling the mosquitoes (30; 15.0)	
Vector control (n; %)	report insufficient practical action to control the vector or stop its reproduction (126; 47.9) report putting garbage in a closed container (213; 81.0)) report closing reservoirs (198; 75.3) report using insecticide in water (231; 87.8)	report insufficient practical action to control the vector or stop its reproduction (104; 52.0) report periodically washing water containers (96; 48.0) report cleaning water reservoirs, tanks, and containers (34; 17.0)	
Mechanical protection (n; %)	report using bed nets (49; 18.6) report using screens on doors and windows (16; 6.1)	report using bed nets (12; 6.0) report using screens on doors and windows (16; 8.0)	

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