Dengue in Brazil: reflections about the largest epidemic in the world and impact of the reduction of mortality

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Introduction: Dengue is an acute febrile disease of viral etiology with a benign course in the classical form and a severe course in the hemorrhagic form. Today, dengue is considered to be the most important arbovirus infection affecting humans. It represents a serious Public Health problem worldwide, especially in countries of tropical and subtropical climate, where environmental conditions favor the development and proliferation of its vectors, *Aedes aegypti* and *Aedes albopictus*. Four serotypes of dengue virus are known, denoted DENV 1, DENV 2, DENV 3 and DENV 4, all of which can cause either the classical and harmless form of the disease or the more severe one. The clinical signs of classical dengue vary widely, but the main manifestation is fever, usually high and of abrupt onset, followed by headache, myalgia, prostration, arthralgia, anorexia, asthenia, retro-orbital pain, nausea, vomiting, and exanthema predominantly of the maculopapular, accompanied by skin itching. The disease lasts 5 to 7 days.

Brazil is a tropical country covered by extensive native forests, with a rapid and disorderly growth of cities that have led to the construction of human dwellings very close to natural areas, an environment favoring the dissemination of mosquitoes.

Objective: Describe and analyze the epidemiology of dengue in Brazil until 2014.

Materials and methods: We analyzed several publications by the Health Ministry, as well as data from the Brazilian Institute of Geography and Statistics and literature reviews (PubMed). The major document source used was the monitoring of the Health Ministry's Epidemiology u to the25th week of 2014, consulted through the internet.

Description of the epidemiological data of dengue in Brazil: The dengue virus was first detected in Brazil as an outbreak in Roraima (North region) in 1981-82, with the presence of serotypes 1 and 4.

The first dengue epidemic in Brazil took place in Rio de Janeiro (Southeast region) in 1986-87, with about 90 thousand cases. During 90 decade, the circulation of the DENV-1 and DENV-2 serotypes spread rapidly to other areas of the Brazilian territory, accompanying the dissemination of the vector mosquito and in 1998 Brazil recorded 700 thousand dengue cases. The DENV-3 serotype was responsible for the 2002 epidemic in Brazil, when approximately 800 thousand cases were notified, i.e., almost 80% of all cases on the American continent. In 2008, more than 700 thousand dengue cases and more than 45 thousand hospitalizations due to the disease were recorded by the Health Ministry of Brazil.

Over the last 50 years, the incidence of dengue has shown a 30-fold increase in the world, with a geographic expansion to new countries and to small towns and rural areas occurring during the current decade. The WHO estimates that almost half the world population lives in countries were dengue is endemic, and Brazil occupied first place among the 30 countries with the largest number of cases in the world from 2004 and 2010.

Dengue epidemic in 2013: The greatest dengue outbreak in Brazil occurred in 2013, with approximately 2 million cases notified. Table 1 shows that 616,387 cases of dengue had been notified in Brazil up to June 21, 2014. The largest number of cases occurred in the Southeast region, followed by the Center-West, Northeast, South and North regions. The Southeast was the region with the largest number of registered serious cases with alarm signals, with 242 deaths confirmed in 2013 and 85 confirmed up to June 2014. Considering all regions of Brazil, there were 6,048 serious cases in 2013, 328 up to June 2014, 4,873 cases with alarm signals, 519 confirmed deaths in 2013, and 209 in 2014, corresponding to a 60% reduction of deaths for the country as a whole. The serotype distribution was: 80.1% DENV 1, 17.7% DENV4, 1.8% DENV2, and 0.4% DENV3.

Table 1. Number of dengue cases notified and incidence per 100,000 inhabitants according to each region and State of Brazil, 2013 and 2014

Region/State	EW 1 to 25		Incidence (/100,000 inhab.)	
	2013a	2014b	2013a	2014b
North	**43,958**	**30,401**	**258.4**	**178.7**
Rondônia	8,512	2,969	492.5	171.8
Acre	2,347	4,725	302.3	608.5
Amazonas	15,445	7,596	405.6	199.5
Roraima	430	652	88.1	133.6
Pará	8,222	5,917	102.8	74.0
Amapá	1,502	951	204.4	129.4
Tocantins	7,5	7,591	507.4	513.5
Northeast	**115,368**	**68,156**	**206.8**	**122.2**
Maranhão	2,827	1,942	41.6	28.6
Piauí	3,667	4,659	115.2	146.3
Ceará	19,144	19,267	218.1	219.5
Rio Grande do Norte	11,631	6,841	344.7	202.8
Paraíba	8,574	4,248	219.0	108.5
Pernambuco	6	9,134	65.2	99.2
Alagoas	6,143	5,726	186.1	173.5
Sergipe	444	2,032	20.2	92.5
Bahia	56,938	14,307	378.5	95.1
Southeast	**898,481**	**358,684**	**1.063.7**	**424.7**
Minas Gerais	413,249	74,603	2,006.7	362.3
Espírito Santo	61,443	17,063	1,600.3	444.4
Rio de Janeiro	207,586	9,142	1.268.2	55.8
São Paulo	216,203	257,876	495.2	590.6
South	**66,709**	**44,851**	**231.7**	**155.8**
Paraná	65,935	44,045	599.5	400.5
Santa Catarina	349	403	5,3	6.1
Rio Grande do Sul	425	403	3.8	3.6
Center-West	**249,441**	**114,295**	**1,663.7**	**762.3**
Mato Grosso do Sul	77,422	6,364	2,992.4	246.0
Mato Grosso	32,231	7,944	1,012.9	249.6
Goiás	129,433	87,147	2,011.7	1,354.5
Federal District	10,355	12,84	371.2	460.3
Total	**1,373,957**	**616,387**	**683.3**	**306.6**

[b]EW = epidemiological week
Source: BRASIL, 2014

Discussion: The Health Ministry promoted campaigns through various media (television, posters, health stations) in order to instruct the population to prevent the occurrence of stagnant water reservoirs in 2014. Health agents systematically visit homes in highly endemic areas in order to detect possible mosquito breeding sites. The strategies for dengue control are being periodically revised in Brazil as qualification in clinical management; application of larvicides and adulticides; improvement of alert and response ability with access to information in real time since all suspected of dengue are notified.

An innovative measure undertaken in Brazil was a technique for the sterilization of *Aedes aegypti* mosquitoes with the introduction of transgenic mosquitoes, preventing dissemination of the virus. It was implemented in 2014, but its impact can be analyzed only in the medium or long term. Another mosquito modified with a bacterium that prevents infection with the dengue virus has been recently introduced in Rio de Janeiro, also with a medium- or long-term impact.

According to the perspective of the WHO, measures of dengue control were expected to be able to reduce mortality and morbidity by at least 50 and 25%. Comparison of data for 2013 and 2014 (up to June) revealed a 60% reduction of deaths in Brazil, exceeding the goal of the WHO and revealing the impact of the measures adopted regarding this important reduction of deaths.

The dry climate during this period may have contributed to a reduced dissemination of the mosquito and consequently of the transmission of the disease. However, the fact remains that there was an effective decrease of morbidity and mortality in Brazil and that the reduced number of deaths was probably due to the implementation of various measures in all health, prevention and care spheres, as described above.

Conclusions

The reduction of the number of deaths in the first semester of 2014 had an important impact in Brazil, showing that the efforts to control dengue should be maintained, even though the most challenging problem is to change the habits of the population and **to** hold it responsible for the domiciliary accumulation of water.