

DENGUE INFECTION IN PARACAMBI, STATE OF RIO DE JANEIRO, 1990-1995

**Rivaldo Venâncio da Cunha, Renato C. Maspero, Marize P. Miagostovich,
Eliane S.M. de Araújo, Daniele da C. Luz, Rita M.R. Nogueira
e Hermann G. Schatzmayr**

A seroepidemiological survey was carried out during 1994 in the municipality of Paracambi, state of Rio de Janeiro. Haemagglutination inhibition test positivity was detected in 145 out of 370 (39.2%) schoolchildren. The frequency of positive test by sex was 53.8% (78/145) female and 46.2% (67/145) male. Distribution by age showed the increasing of antibody positivity in older children. Strains of dengue virus type 1 and dengue virus type 2 were isolated before (1990) showing the co-circulation of both serotypes in that area. The house index infestation of Aedes albopictus and Aedes aegypti has been determined.

Key-words: Dengue virus. Seroepidemiological survey. HAI antibodies.

Dengue virus activity has been demonstrated in Rio de Janeiro since 1986 when dengue virus type 1 (DEN-1) was first isolated¹⁵. Four years later, another serotype, dengue virus type 2 (DEN-2) was introduced¹² and since then both strains co-circulate causing outbreaks and even large epidemics in the state with increased transmission associated with the rainy season¹³.

Paracambi is a municipality with approximately 40.000 inhabitants, located 80km from Rio de Janeiro⁶, being a periurban city with own characteristics. The county has a small urban area with environments conditions that allow natural breeding of *Aedes aegypti* and *Aedes albopictus*. Because of its geographic position, the presence of both vectors and dengue activity, we carried out a seroepidemiological survey to determine the prevalence of dengue virus infection in the area. This paper describe the virological, clinical and entomological data of a five years (1990-1995) study in Paracambi.

MATERIALS AND METHODS

Virology and serology. Virus isolation was attempted from human acute phase sera as described before¹¹ by inoculation into a of clone C6/36 of *Ae. albopictus* cells⁹. Virus isolates were typed by indirect fluorescent antibody test (IFAT) using serotype-specific monoclonal antibodies⁷.

IgM capture enzyme-linked immunosorbent assay (Mac-Elisa) was performed for routine serodiagnosis using serotype specific antigens DEN-1 and DEN-2, as described previously¹⁰.

Serological survey. Blood samples from 370 schoolchildren with age ranging from 4 to 16 years old were obtained in public schools of Paracambi by fingertip puncture and collected on filter paper discs (Whatman N° 1). The sample size was based on the prevalence of haemagglutination inhibition antibodies detected in previous inquires carried out in others municipalities of the state^{3 4 5}. The confidence level of 95%, a sampling error of 10% and a refusal possibility of 25% were considered. Parents or responsible for children gave a formal consent for blood collection. The haemagglutination inhibition test (HAI) was carried out according the method of Clarke & Casals, 1958². Blood samples were treated with kaolin (Sigma) and goose erythrocytes for remotion of non-specific inhibitors and natural haemagglutinins, respectively.

Antigens. DEN-1 (Mochizuki strain) and DEN-2 (New Guinea strain) antigens were prepared by intracerebral inoculation of suckling

Disciplina de Doenças Infecciosas e Parasitárias, Departamento de Clínica Médica, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, Curso de Pós-Graduação em Medicina Tropical, Laboratório de Flavivírus, Departamento de Virologia do Instituto Oswaldo Cruz/FIOCRUZ, Rio de Janeiro e Secretaria de Saúde de Paracambi, RJ.

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Address to: Prof. Rivaldo Venâncio da Cunha. R. Dr. Armando Cunha 483, Bairro Jardim Villas Boas, 79051-040 Campo Grande, MS. E mail: rivaldoc@alanet.com.br

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mice and extracted by sucrose-acetone method².

Vectors house index. House index for *Ae. aegypti* and *Ae. albopictus* were determined¹⁴ during 1991 to 1994 by the Secretary of Health of Paracambi all over the municipality which includes 13 localities.

RESULTS

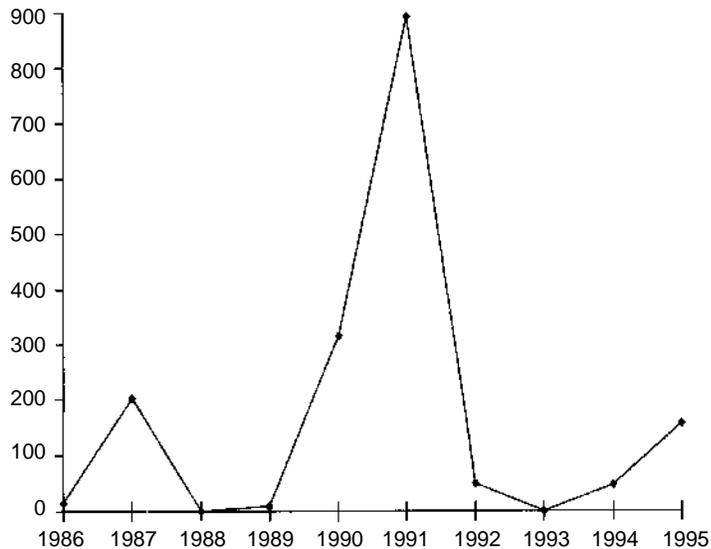
Virological and clinical findings. Laboratorial data obtained from 1990 to 1995 are shown in Table 1. In 1990 both serotypes (DEN-1 and DEN-2) were isolated and the remaining cases were confirmed by serology (IgM). Twenty-one cases of dengue haemorrhagic fever were reported between April 1990 to November 1991. No dengue cases were confirmed by laboratory during 1992 to 1994, although dengue cases have been reported in these years (Figure 1).

Table 1 - Laboratorial confirmation on dengue suspected cases in Paracambi, RJ, 1990-1995.

Year	Nº		Dengue virus isolation
	positive	studied	
1990	20	52	DEN-1- 7 e DEN-2 - 5
1991	12	103	-
1992	0	9	-
1993	0	0	-
1994	0	20	-
1995	5	30	DEN-2 - 2

Serological survey. HAI antibody titres equal or greater than 1/20 to DEN-1 and/or DEN-2 was detected in 39,2% (145/370) of the tested samples. The geometric mean of antibody titres was 1/75 for DEN-1 and 1/30 for DEN-2 (Table 2).

The absolute and relative frequencies of positive tests by age group and when compared to extreme age groups show statistically significant differences ($\chi^2 = 15,07$; $p < 0,005$).



Source: Secretary of Health/Municipality of Paracambi, RJ.

Figure 1 - Dengue reported cases in Paracambi, RJ, 1986-1995.

The absolute and relative frequencies of positive tests by sex did not show statistically significant differences; nevertheless the total result shows a slight predominance of the positivity for the female group (Table 3).

Entomological findings. In the beginning of 1991 when entomological surveillance was established house index of *Ae. aegypti* ranged from 2% to 7% in some localities (Lages, Sabugo, Centro). After this program, in 1994,

the index declined from 0.0% to 2.0%. During the same period all over localities showed

higher house index of *Ae. albopictus* ranging from 0.6% to 7.4%.

Table 2 - HAI antibodies titres in schoolchildren in Paracambi, RJ, 1994.

Antibody titres	DEN-1*		DEN-2**	
	n°	%	n°	%
1/20	27	20.0	35	52.2
1/40	35	25.9	24	35.8
1/80	28	20.7	8	12.0
1/160	26	19.3	-	-
1/320	11	8.1	-	-
1/640	4	3.0	-	-
1/1280	4	3.0	-	-
Total	135	100.0	67	100.0

* Geometric mean =1/75; ** Geometric mean =1/30

Table 3 - Age and sex distribution of dengue HAI antibodies in Paracambi, RJ, 1994.

Age (in years)	Sex								
	female			male			total		
	positive	studied	%	positive	studied	%	positive	studied	%
≤ 10	12	47	25.5	12	55	21.8	24	102	23.5
11-14	39	91	42.8	28	70	40.0	67	161	37.9
≥ 15	27	59	45.7	27	48	56.2	54	107	50.5
Total	78	197	39.6	67	173	38.7	145	370	39.2

P = 0,61351; $\chi^2 = 0,98$

DISCUSSION

During DEN-1 epidemic (1986/1987) in the state of Rio de Janeiro, 217 dengue cases were notified in Paracambi, however laboratorial confirmation occurred only in 1990, when DEN-1 and DEN-2 viruses were isolated. In 1990/1991 the number of reported cases reached 1209 with a total of 21 cases of dengue haemorrhagic fever. As observed in the municipality of Rio de Janeiro and Niterói the disease was more severe after the introduction of DEN-2 virus¹³.

To study the prevalence of dengue infection after these outbreaks we adopted a sampling plan for the seroepidemiological survey that limited the generalization of the results to the whole population of the Paracambi municipality. Nevertheless the results obtained are acceptable to determine the serological profile of dengue infection in the studied population. On the other hand, if we consider that the introduction of dengue virus in this municipality is relatively recent (1986), being therefore all age groups susceptible to the virus, we can expect a prevalence of dengue infections in the other age groups close to that of the examined

schoolchildren. Considering the seropositivity of 39.2% and the population of Paracambi, about 16.000 persons should have been infected in this municipality, since the introduction of dengue until the time that the present study was done.

Serological surveys in the municipality of Rio de Janeiro during 1986 and 1987 showed 24.9% and 45.5% of HAI antibodies for DEN-1 serotype⁵. In Niterói, others surveys detected 62.4 % e 55.0% of seropositivity to DEN-1 in 1987 and 1988, respectively⁴, and 66% to DEN-1 and/or DEN-2 in 1991/1992³. All these serological surveys were carried out in schoolchildren. Our data are comparable with the results obtained in different areas, with the similar epidemiological aspects. At Cuba, two national serological investigations estimated in 44.5% the levels of HAI antibody after DEN-1 epidemic in 1978 and in 42.0 % after DEN-2 epidemic in 1982^{1 8}.

Serological results, when related to sex, did not show statistically significant differences, although we detected a slight predominance of seropositivity for the female group. A small

positivity predominance for that group were observed in the all investigations cited before. An increasing of positivity related to age was seen but it is only statistically significant when compared to extreme age groups.

The geometric averages of antibodies titres were 1/75 and 1/30, to DEN-1 and DEN-2, respectively, and were similar to that found in 1987 and 1988 in Niterói⁴. Geometric averages of 1/182 and 1/71, to DEN-1 and DEN-2, respectively were detected in Niterói in 1991/1992³. The ranging of geometric average could be explained by the elapsed time since the survey was carried out and the epidemic activity. Niterói seroepidemiological survey was carried out after the decline of epidemic and, by other hand, this study was done 3 years after the peak of epidemic in the state. Levels of HAI antibodies as high as 1/20000 was detected in several cases of dengue haemorrhagic in Niterói. Two years later those patients showed a significant decrease on HAI antibodies titers (1/160) (RMR Nogueira, data not published).

Low dengue activity between 1991 to 1994 agree with low house index of *Ae. aegypti* in spite of high level of *Ae. albopictus* house index in same period. Unfortunately the interruption on vectors measures control allowed again the dengue transmission in the area.

RESUMO

Um inquérito soropidemiológico foi realizado em uma amostra de escolares, em 1994, no município de Paracambi, Estado do Rio de Janeiro. Positividade do teste de Inibição da Hemaglutinação foi detectada em 39,2% (145/370) dos escolares pesquisados. A frequência de positividade foi de 53,8% (78/145) para o sexo feminino e de 46,2% (67/145) para o sexo masculino. A distribuição por faixa etária mostrou uma positividade crescente com o aumento da idade. Cepas do vírus dengue tipo 1 e vírus dengue tipo 2 foram isoladas anteriormente (1990), mostrando a co-circulação de ambos os sorotipos na área. Os índices de infestação predial pelo Aedes aegypti e pelo Aedes albopictus foram determinados.

Palavras-chaves: Vírus Dengue. Inquérito Soropidemiológico. Anticorpos Inibidores da Hemaglutinação.

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