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

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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 boise index infestation of Aedes albopictus and Aedes aegypti has been determined.

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

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 Nº 1). The sample size was based on the prevalence of haemagglutination antibodies detected in previous inquires carried out in others municipalities of the state3 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 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

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mice and extracted by sucrose-acetone method.

**Vectors house index.** House index for *Ae. aegypti* and *Ae. albopictus* were determined 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).

**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,

![Graph](image)

**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).

**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 ($\chi^2 = 15.07; p < 0.005$).

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Nº studied</th>
<th>Dengue virus isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>20</td>
<td>DEN-1: 7 e DEN-2: 5</td>
</tr>
<tr>
<td>1991</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>1992</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>1993</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>1994</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>1995</td>
<td>5</td>
<td>DEN-2: 2</td>
</tr>
</tbody>
</table>

![Graph](image)

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

**DISCUSSION**

During DEN-1 epidemic (1986/1987) in the state of Rio de Janeiro, 217 dengue cases were notified in Paracambi, however laboratory 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 virus.13

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 serotype. In Niterói, others surveys detected 62.4% and 55.0% of seropositivity to DEN-1 in 1987 and 1988, respectively, and 66% to DEN-1 and/or DEN-2 in 1991/1992. 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 1982.8

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

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

<table>
<thead>
<tr>
<th>Antibody titres</th>
<th>DEN-1*</th>
<th></th>
<th>DEN-2**</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1:20</td>
<td>27</td>
<td>20.0</td>
<td>35</td>
<td>52.2</td>
</tr>
<tr>
<td>1:40</td>
<td>15</td>
<td>25.9</td>
<td>24</td>
<td>35.8</td>
</tr>
<tr>
<td>1:80</td>
<td>18</td>
<td>20.7</td>
<td>8</td>
<td>12.0</td>
</tr>
<tr>
<td>1:160</td>
<td>26</td>
<td>19.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1:320</td>
<td>11</td>
<td>8.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1:640</td>
<td>4</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1:1280</td>
<td>4</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>100.0</td>
<td>67</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*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) | female |  | male |  | total |  |
|----------------|--------|-------|------|-------|-------|
|                | positive | studied | % | positive | studied | % | positive | studied | % |
| ≤10            | 12      | 47     | 25.5| 12      | 55     | 21.8| 24      | 102     | 23.5|
| 11-14          | 27      | 90     | 42.8| 28      | 70     | 40.0| 55      | 161     | 37.9|
| ≥15            | 26      | 59     | 45.7| 27      | 48     | 56.2| 53      | 107     | 50.5|
| Total          | 75      | 197    | 39.6| 67      | 175    | 38.7| 145     | 370     | 39.2|

*P = 0.61351; χ² = 0.98
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 Niterói. Geometric averages of 1/182 and 1/71, to DEN-1 and DEN-2, respectively, were detected in Niterói in 1991/1992. The ranging of geometric average could be explained by the elapsed time since the survey was carried out and the epidemic activity. Levels of HAI antibodies titers 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 soroepidemiológico 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 freqüência 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.


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