Serodiagnosis of dengue during an outbreak at a tertiary care hospital in Delhi

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Dengue, an important human arboviral infection, is endemic in many parts of India. Outbreaks are now reported quite frequently from different parts of the country. We report here findings of serological investigation of serum samples received during a recent outbreak of dengue infection in Delhi from September to November 2003. Acute phase serum samples from suspected cases of dengue infection (including dengue fever, dengue haemorrhagic fever and dengue shock syndrome) of duration ≥ 5 days, were tested for dengue specific IgM antibodies by enzyme linked immunosorbant assay (ELISA). Of the 874 serum samples tested, 456 (52.3%) were positive for dengue specific IgM antibodies. The maximum number of positive cases was reported in October, peaking in second and third week. Patients in the age group of 21-30 yr accounted for 34.2 per cent of positive cases. This outbreak was less severe as compared to the previous 1996 outbreak and showed a shift towards an older age group.

Key words Delhi - dengue - outbreak - serodiagnosis

Dengue virus infection in humans causes a spectrum of illness ranging from inapparent or mild febrile to severe and fatal haemorrhagic disease. Severe manifestations of dengue virus infection include dengue shock syndrome (DSS) and dengue haemorrhagic fever (DHF), both of which were common during the previous outbreak in 1996 in Delhi. Delhi has experienced six outbreaks of dengue virus infection since 1967 with the last reported in 1996.

We report an outbreak of dengue infection that occurred in Delhi during September to November 2003, peaking during the second and third week of October (Fig.). Acute phase clotted blood samples received from clinically suspected cases of dengue infection, presenting to the outpatients department and emergency at All India Institute of Medical Sciences...
(AIIMS), New Delhi were tested for dengue specific IgM antibodies, if the duration of fever was ≥ 5 days. Serum was separated aseptically and stored at -70°C until further processing.

A total of 874 samples were received from cases of suspected dengue infection and screened for the presence of dengue specific IgM antibodies by IgM capture ELISA (MAC-ELISA), using a commercial kit (PanBio, Brisbane Australia), following the manufacturer’s protocol. O.D was measured at 450 nm using an ELISA reader (Labsystems Multiskan Plus Finland).

Of the 874 serum samples, 521 were from indoor patients. The total number of deaths was 7 (mortality 1.3%). The number of samples positive for dengue virus specific IgM antibodies was 456 (52.3%) of which 213 were from indoor patients. The first sample that tested positive for dengue IgM antibody was received on 5th September. The number of samples received for testing in September, October and November were 62 (13.6%), 279 (61.2%) and 115 (25.2%) respectively. The data showed that the maximum numbers of cases were diagnosed in October, with the peak seen during the second and third week (Fig.). The male to female ratio was 2.1:1. The largest number of positive samples was from the age group 21-30 yr, which accounted for 34.2 per cent of total positive cases (Table).

During the present outbreak of dengue in Delhi, World Health Organization (WHO) reported a total number of 2185 laboratory confirmed cases. During the 1996 outbreak of dengue/ DSS/ DHF in Delhi and surrounding areas, more than 10252 hospital admissions and 423 deaths were reported. During the present outbreak, the number of suspected dengue cases admitted to the AIIMS was 521, with a mortality of 1.3 per cent. This is less compared to the 1996 dengue epidemic, when a total number of 703 cases were admitted at AIIMS, with a mortality of 10.8 per cent. This suggests that the present dengue outbreak was smaller in scale and severity.

This outbreak of dengue in Delhi occurred during the monsoon season (September-November), which is similar to most of the previous outbreaks in India. The peak in cases seen during mid-October is also in accordance with previous reported outbreaks in India.

Dengue specific IgM antibodies were positive in 52.3 per cent of the acute phase sera, which, incidentally, is exactly similar to the 52 per cent IgM seropositivity found by us in the 1996 outbreak.

Dengue affects humans of all age groups worldwide. In some parts of the world it is mainly paediatric public health problem. In 1996, we found that the maximum number of seropositive cases were in the 5-20 yr age group. Also, 40 per cent of our culture positive cases were children between 5-12 yr old. According to another report of the same outbreak, the 11-15 yr age group was most affected, with 32.2 per cent cases falling within it. In the present study, the maximum number of positive cases was found in 21-30 yr age group. Recently studies from Singapore, Indonesia and Thailand have also shown that in areas where dengue infection is either endemic or epidemics are more frequent, a shift occurs in the predominant age group involved. This shift in the affected age group may be attributable to changes in locations where disease transmission takes place.

### Table. Age distribution of dengue IgM positive cases (n = 456)

<table>
<thead>
<tr>
<th>Age group (yr)</th>
<th>No. of cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>113 (24.8)</td>
</tr>
<tr>
<td>11-20</td>
<td>101 (22.2)</td>
</tr>
<tr>
<td>21-30</td>
<td>156 (34.2)</td>
</tr>
<tr>
<td>31-40</td>
<td>50 (11.0)</td>
</tr>
<tr>
<td>&gt;40</td>
<td>36 (7.9)</td>
</tr>
</tbody>
</table>

### Fig. Weekly distribution of dengue cases.
Lessons learned from 1996 outbreak prompted the local government to take quick control measures during 2003 outbreak. This included intensive household mosquito elimination programmes. This may have shifted the affected mosquito population towards non-residential areas and thereby infecting the mobile working population (21-30 yr). Some of the previous reports from South East Asia support this hypothesis, even though it needs more epidemiological data and further studies\textsuperscript{15,18,19}.

In conclusion, we report the serological confirmation of the dengue outbreak that occurred in Delhi from September to November 2003. It was less severe compared to the previous outbreak in 1996, and showed an upward shift in the most affected age group to 21-30 yr.

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References


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