

## Short Research Communications

# Preliminary investigation of dengue vectors in Ranchi, India

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Dengue has become a serious public health problem in India. More than 50 outbreaks of dengue have been reported in different parts of the country<sup>1,2</sup>. In India *Aedes aegypti* Linn (Diptera: Culicidae) is a principal vector of dengue and dengue haemorrhagic fever (DHF)<sup>3</sup>. Dengue virus has also been recently detected in *Ae. albopictus* Skuse<sup>4</sup>. *Ae. aegypti* has a wide-spread distribution in many towns and cities of India<sup>5,6</sup>. Now this vector is spreading to rural areas also<sup>7,8</sup>.

Dengue has so far not been reported in Jharkhand state in India and for the first time during September to November 2006 about 1000 fever cases were reported and among them there were 13 confirmed cases of dengue and few unreported cases also occurred. Upon the request of the State Health Department, a detailed entomological investigation was carried out in Ranchi City from October to December 2006 with a view to study the prevalence, distribution and stratification of areas for *Aedes* species; and identify high risk areas in city prone to dengue/DHF outbreaks. Ranchi the capital city of Jharkhand is situated at an altitude of 2140 ft above the mean sea level. The mean minimum and maximum temperature ranges between 16.8 and 40.7°C and the average humidity ranges from 69 to 94%. All the localities within the municipal limits of Ranchi City were surveyed. The number of houses visited in each locality varied depending upon the expanse of

the area and types of houses. All kinds of breeding habitats in the study areas like unused wells, tree holes, empty coconut shells, drums/tubs/tanks, overhead tanks, iron/metal drums, empty battery box, junk materials, desert coolers, curing tanks, etc. were screened for the presence of immature stages of *Aedes* mosquitoes. The data on larval survey were analyzed and calculated in terms of container index (CI), house index (HI), breteau index (BI) and pupal index ((PI) as per guidelines<sup>2</sup>. Pupal index was calculated as total number of pupae collected per 100 houses. The container preferences of *Ae. aegypti* breeding were assessed by calculation of breeding preference ratio (BPR)<sup>9</sup>. Adult *Aedes* mosquitoes were collected with the help of aspirators and flashlights during morning hours (0700–0900 hrs) from tyres, cement tanks, iron pipes, etc. and identified up to species level with the help of standard identification keys<sup>10</sup> and per man hour density was also calculated for each locality.

The results revealed that all the wards spread over municipal areas of Ranchi City were found positive for *Ae. aegypti* mosquitoes. In addition to this *Ae. albopictus* was also found in Karbala and Kachari areas. Breeding of *Ae. aegypti* was observed in all kinds of temporary and permanent water bodies both indoors and outdoors in residential areas. Common breeding habitats included broken glassware, plastic and cement tanks/tubs, discarded tyres, empty coco-

nut shells, earthen pots, flower vases, junk materials, desert coolers and iron drums. In addition, breeding was also observed in unused wells, overhead tanks, empty battery box, tree holes and curing tanks during survey. The distribution of *Aedes* species larvae in different breeding habitats is given in Table 1. Among all the habitats, the maximum positivity of *Aedes* larvae was recorded in coconut shells and discarded tyres, followed by junk materials, metal and plastic containers, and earthen pots.

A total of 522 houses were searched for *Aedes* breeding and breeding could be detected in 177 houses. About 4792 water containers were searched, out of which 929 were found positive for *Aedes* breeding. The over all house index (HI), container index (CI), breteau index (BI) and pupal index were 33.90, 19.38, 177.06 and 49.42 respectively (Table 2).

In the present study, adults/immature stages of *Ae. aegypti* were recorded in all the localities surveyed

within the urban agglomeration of Ranchi probably for the first time and breeding was found to vary in each locality. In Mumbai also, the distribution pattern of *Ae. aegypti* disposition varied from ward-to-ward<sup>11</sup>. Contrary to this, its breeding was equally distributed in all the sectors in Rourkela Steel Plant<sup>12</sup>. In the present study, the maximum positivity of *Aedes* larvae was recorded in coconut shells and discarded tyres. However, breeding was also observed in unused wells and tree hole/plant axils. It was also observed that water containers lying indoors were the preferred breeding habitats. Studies conducted in Kolkata City also support our findings<sup>6</sup>. These containers, which are kept indoor are rarely cleaned and remain undisturbed most of the time, thus resulting in high breeding of *Aedes* mosquitoes.

From the present entomological investigations, it can be concluded that *Ae. aegypti* is well-established within the urban agglomeration of Ranchi City, with most of the areas showing high adult and larval

**Table 1. Breeding preference ratio (BPR) of *Aedes* spp in different breeding habitats in Ranchi City**

| Type of breeding habitats | No. of containers with water |       |                             |       | Breeding preference ratio BPR (Y/X) |
|---------------------------|------------------------------|-------|-----------------------------|-------|-------------------------------------|
|                           | Examined                     | (X%)  | With<br><i>Aedes</i> larvae | (Y%)  |                                     |
| Desert cooler             | 2                            | 0.04  | 0                           | 0     | 0                                   |
| Flower vase               | 420                          | 8.76  | 13                          | 1.39  | 0.16                                |
| Earthen pot               | 178                          | 3.71  | 38                          | 4.29  | 1.10                                |
| Cement tank/tub           | 490                          | 10.23 | 101                         | 10.87 | 1.06                                |
| Metal container           | 163                          | 3.40  | 37                          | 3.98  | 1.17                                |
| Plastic container         | 740                          | 15.44 | 144                         | 15.50 | 1.00                                |
| Discarded tyre            | 1026                         | 21.41 | 403                         | 43.38 | 2.03                                |
| Coconut shells            | 37                           | 0.77  | 23                          | 2.47  | 3.21                                |
| Broken glassware          | 42                           | 0.88  | 11                          | 1.18  | 1.34                                |
| Plastic tub/drum/tank     | 594                          | 12.36 | 24                          | 2.58  | 0.21                                |
| Unused well               | 166                          | 3.46  | 32                          | 3.44  | 0.99                                |
| Iron drum/tub             | 665                          | 13.88 | 63                          | 6.78  | 0.49                                |
| Plant axils               | 1                            | 0.02  | 1                           | 0.11  | 0                                   |
| Plastic OHT               | 74                           | 1.54  | 8                           | 0.86  | 0.56                                |
| Cemented OHT              | 89                           | 1.86  | 5                           | 0.54  | 0.29                                |
| Junk materials            | 81                           | 1.69  | 23                          | 2.47  | 1.46                                |
| Battery box               | 24                           | 0.50  | 3                           | 0.32  | 0.64                                |
| Total                     | 4792                         |       | 929                         |       |                                     |

**Table 2. Prevalence indices of *Aedes* spp in different localities of Ranchi City**

| Locality          | No. of houses visited | No. found positive | No. of containers searched | No. found positive | No. of pupae collected | HI (%) | CI (%) | BI (%) | PI (%) |
|-------------------|-----------------------|--------------------|----------------------------|--------------------|------------------------|--------|--------|--------|--------|
| <i>Posh area</i>  |                       |                    |                            |                    |                        |        |        |        |        |
| Lohara kucha      | 37                    | 13                 | 232                        | 45                 | 12                     | 35.13  | 19.39  | 121.62 | 32.42  |
| Pandra            | 94                    | 23                 | 692                        | 95                 | 10                     | 24.46  | 13.73  | 101.06 | 10.64  |
| ICCM Colony       | 47                    | 11                 | 316                        | 33                 | 7                      | 23.40  | 10.40  | 70.21  | 14.89  |
| AG More           | 50                    | 5                  | 550                        | 50                 | 7                      | 10     | 9.10   | 100    | 14     |
| <i>Mixed area</i> |                       |                    |                            |                    |                        |        |        |        |        |
| Panchwati         | 30                    | 11                 | 313                        | 47                 | 4                      | 36.67  | 15.02  | 156.67 | 13.33  |
| Kadru             | 22                    | 6                  | 160                        | 21                 | 12                     | 27.27  | 13.10  | 95.45  | 54.55  |
| Laxmi Nagar       | 41                    | 9                  | 520                        | 75                 | 21                     | 21.95  | 14.40  | 182.92 | 51.21  |
| Railway Colony    | 55                    | 27                 | 765                        | 83                 | 33                     | 49.10  | 10.84  | 150.91 | 60     |
| <i>Slum area</i>  |                       |                    |                            |                    |                        |        |        |        |        |
| Karwla            | 27                    | 24                 | 571                        | 168                | 84                     | 88.89  | 29.42  | 622.22 | 311.12 |
| Harmu             | 48                    | 31                 | 461                        | 258                | 56                     | 65.96  | 55.84  | 343.90 | 116.67 |
| Baryatu           | 16                    | 3                  | 39                         | 14                 | 3                      | 18.75  | 36.89  | 87.50  | 18.75  |
| HEC basti         | 55                    | 14                 | 173                        | 40                 | 9                      | 25.45  | 23.10  | 72.73  | 16.36  |
| Total             | 522                   | 177                | 4792                       | 929                | 258                    | 33.90  | 19.38  | 177.06 | 49.42  |

indices which may be the probable reason for sudden spurt of dengue in this area. Stringent measures such as integrated vector management, minimizing the breeding potential of *Ae. aegypti* by adopting one day bottom up programme, water management practice by individuals along with implementation of urban by-laws as well as IEC activities are suggested to contain epidemics in future.

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