# DISTRIBUTION OF POTENTIAL DENGUE VECTORS IN MAJOR TOWNSHIPS ALONG THE NATIONAL HIGHWAYS AND TRUNK ROADS OF NORTHEAST INDIA

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**Abstract.** Surveys were conducted in some townships along the national highways and trunk roads of northeast India to detect breeding of *Aedes* mosquitos in used/waste tire dumps piled outdoors by the tire repairing shops during summer season of 1996-1997. The breeding of both the potential vectors of dengue, *viz. Aedes aegypti* and *Ae. albopictus* were detected, prevalence rate being in the range of 30.0-88.0 (CI = container index value). The preponderance of *Ae. aegypti* was considerably much higher than that of *Ae. albopictus* and all the urban and semiurban areas coming up along the side of the roads were observed to be infested with *Ae. aegypti*. With respect to transmission of dengue, this study clearly indicates that waste tire dumps in every urban agglomeration should receive primary attention in view of their relative contribution to the abundance and dispersal of these vector mosquitos.

## INTRODUCTION

In India, the occurrence of outbreaks of dengue hemorrhagic fever (DHF) is restricted to the large towns and cities due to the prevalence of vector mosquitos, *viz Aedes aegypti* and *Ae. albopictus*. There are available reports of widespread dengue epidemics which occurred in many places of India (Basset-Smith, 1897; Mahadev *et al*, 1993; Biswas *et al*, 1997). In the year 1996 also, there was a widespread epidemic of dengue in Delhi and adjoining areas causing high morbidity and mortality. Uptil now, no such outbreak of dengue has been experienced in the northeastern (NE) part of India although detection of seropositive cases for dengue virus 2 and 4 from this part has been reported (Barua and Mahanta, 1996; Barua *et al*, 1996). The status of prevalence of dengue vector mosquitos in different townships of NE states is not known. Due to rapid urbanization and increase in road traffic, roadside garages and temporary vendors are coming up in NE region. In every township and suburban area, there are waste tire dumps on the outskirts of the tire repairing shops where rain water accumulates, thereby forming a major habitat for excellent breeding of *Aedes* mosquitos. In relation to profuse breeding and dispersal of these potential dengue vector mosquitos, the used tires are playing major role and therefore, receiving worldwide attention (Reiter and Sprenger, 1987; Hawley *et al*, 1987; Craven *et al*, 1988). In the present study, the waste tires available in some townships along the national highways and major roads of NE India were searched to know the distribution of potential dengue vector mosquitos in such habitat and the findings have been discussed.

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## MATERIALS AND METHODS

### Study area

Townships along the national highways and major roads of Assam, Arunachal Pradesh, Meghalaya and Nagaland (Fig 1) were searched considering plains, foothills and high altitude areas (300-5,000 feet above mean sea level). The surveys were made during summer season of the year 1996-1997.

### Entomological survey

Two to five localities in each township on the basis of the availability of waste tire dumps were taken for searching of mosquito breeding. Every tire was searched and the water samples from tires (positive for mosquito breeding) were taken in different containers and recorded. These were transported to the field or main laboratory and reared till emergence of adults so as to confirm the identification. The breeding potential of the different *Aedes* species in these containers (tires) was denoted by container index (CI = % containers positive for breeding) values.

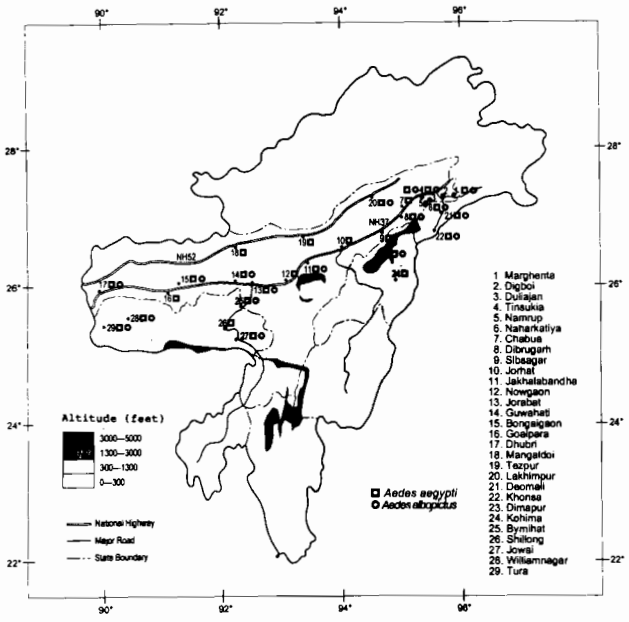


Fig 1–Map of northeast India showing the infestation of potential dengue vectors in the study areas.

## RESULTS AND DISCUSSION

In the present study, 798 waste tires distributed in 29 townships of NE India were searched. Out of 674 wet tires, 54.2% tires on an average was found to be positive for mosquito larvae. The CI value ranged from 30.0-88.0 (varying from place to place). Both the potential vectors of dengue, *viz Aedes aegypti* and *Ae. albopictus* were detected to breed in the waste tires. The preponderance of *Ae. aegypti* was much higher than that of *Ae. albopictus* and its invasion was observed in all the townships surveyed (Table 1). The CI value recorded for *Ae. aegypti* was found to be in the range of 27.0-75.0 % whereas for *Ae. albopictus*, CI value was recorded to be in the range of 0.0-20.0%. *Ae. aegypti* is the dominant species and depicts centripetal distribution with seasonal pulsation. In peripheral/ semiurban areas, it co-exists with *Ae. albopictus* or other *Stegomyia*. Rapid urbanization tends to increase the habitats suitable for this exotic species. While *Ae. albopictus* thrives in semiurban, rural and sylvan ecosystems. Therefore in cities or in townships where there are abundantly growing vegetation, the co-existence of both these species is observed.

During the course of study, the townships situated in plain, foothill and high hill areas (altitudes ranging from 100-1,500 m above mean sea level) were surveyed but in regards to distribution of potential dengue vectors, no marked difference is noticed. The distribution pattern, on the other hand, was more or less similar in all the townships surveyed regardless of altitudes. It may be noted that during severe winter in the high altitude areas, the breeding of these mosquitos ceases and the tires also get dried up. Eggs of these mosquitos can withstand dessication for a longer period and when rainy season comes, the eggs hatch and life cycle starts. As a result, tire dumps form the major as well as permanent breeding habitats for these container breeding mosquitos in urban agglomeration contributing a lot for dispersal of these mosquito species. It is reported that the commercial movement of used tires is implicated in the movement of *Ae. aegypti* throughout the southeast USA (Reiter and Sprenger, 1987) and in rapid dispersal of *Ae. albopictus* in USA (Craven *et al*, 1988), Italy (Dalla Pozza *et al*, 1994) and throughout Georgia (Womac *et al*, 1995) with a presumption that adults have moved by motor vehicles which also contribute to dispersal of this species.

The present study reveals that the major townships viz Guwahati, Tezpur, North Lakhimpur, Dibrugarh, Jorhat, Shillong, Dimapur, Kohima are already infested with potential dengue vector mosquitos. As these townships are the gateways of the remaining townships of northeastern states, it is presumed that these potential dengue vectors have invaded the other townships also.

This finding suggests that the NE part of India is at high risk of getting dengue outbreaks. The commercial movement of used tires from dengue endemic zones can carry the dessicated eggs of these species along with the virus to spread the infection (transovarial transmission) (Khin and Than, 1983; Rosen *et al*, 1983). As there is vector abundance in most of the townships as well as existence of proven dengue fever cases, therefore, there is threat of occurrence of outbreak of dengue in this part of the country. Considering this danger from the waste tires, it is indeed a needful act of the administrative authority and local municipal bodies to give attention for proper storage and movement of used tires and if possible to include it under Model Civic By-laws in urban areas which are presently followed under Malaria Action Program (NMEP, Delhi, 1995) for urban malaria control.

Table 1

Record of potential dengue vector mosquito breeding in used tire dumps in the townships surveyed.

| State | Township | Tires searched | | | CI for *Ae. aegypti* (%) | CI for *Ae. albopictus* (%) |
|---|---|---|---|---|---|---|
| | | Total tires | Wet tires | +ve for larvae | | |
| Assam | Margherita | 30 | 26 | 12 | 42.3 | 3.8 |
| | Digboi | 20 | 15 | 10 | 53.3 | 13.3 |
| | Duliajan | 18 | 15 | 11 | 60.0 | 13.3 |
| | Tinsukia | 36 | 30 | 17 | 53.3 | 3.3 |
| | Namroop | 17 | 13 | 9 | 53.8 | 15.3 |
| | Naharkatia | 22 | 19 | 12 | 52.6 | 10.5 |
| | Chabua | 16 | 14 | 8 | 57.1 | 0.0 |
| | Dibrugarh | 45 | 40 | 25 | 52.5 | 10.0 |
| | Sibsagar | 25 | 20 | 12 | 60.0 | 0.0 |
| | Jorhat | 32 | 25 | 12 | 48.0 | 0.0 |
| | Jakhalabandha | 14 | 10 | 7 | 50.0 | 20.0 |
| | Nagaon | 28 | 22 | 10 | 45.4 | 0.0 |
| | Jorabat | 42 | 36 | 18 | 44.4 | 5.5 |
| | Guwahati | 60 | 48 | 20 | 39.5 | 2.0 |
| | Mangaldoi | 18 | 15 | 8 | 53.3 | 0.0 |
| | Tezpur | 24 | 20 | 11 | 55.0 | 0.0 |
| | N. Lakhimpur | 22 | 17 | 10 | 47.0 | 11.7 |
| | Bongaigaon | 18 | 12 | 7 | 50.0 | 8.3 |
| | Dhubri | 30 | 22 | 10 | 36.3 | 9.0 |
| | Goalpara | 15 | 10 | 6 | 60.0 | 0.0 |
| Arunachal | Deomali | 25 | 25 | 22 | 72.0 | 16.0 |
| Pradesh | Khonsa | 26 | 22 | 10 | 40.9 | 4.5 |
| Nagaland | Dimapur | 35 | 32 | 27 | 75.0 | 9.3 |
| | Kohima | 22 | 20 | 10 | 50.0 | 0.0 |
| Meghalaya | Byrnihat | 38 | 37 | 12 | 27.0 | 5.4 |
| | Shillong | 42 | 40 | 12 | 30.0 | 0.0 |
| | Jowai | 40 | 35 | 18 | 40.0 | 11.4 |
| | Tura | 26 | 22 | 12 | 50.0 | 4.5 |
| | Williamnagar | 12 | 12 | 7 | 41.6 | 16.6 |

CI = Container index value

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