

Manmade Environment and the Risk of Acquiring Dengue in the Northeastern Part of India: An Entomological Perspective

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ABSTRACT Human ecology sometimes influences upon the abundance of some of the disease transmitting insect vectors. Studies conducted to know the prevalence of potential dengue vectors in the Northeastern part of India reveal that in urban, industrial and semiurban environment, the preponderance of the potential dengue vectors are found to be considerably high. It is observed that the situations in which these *Aedes* mosquitoes survive or reproduce are created by man knowingly or unknowingly and as a result, human population residing in an around this environment are always at risk of acquiring dengue virus infection.

INTRODUCTION

In recent years, the emergence or re-emergence of mosquito borne diseases are becoming a subject of concern all over the world. Frequent outbreaks of malaria and mosquito borne viral diseases like Japanese encephalitis (JE), dengue, Chikungunya cause huge mortality and economic losses in Southeast Asian countries. Dengue fever was described in India on the basis of clinical symptoms as far back as 1921. From 1956 to 1996, several out breaks occurred in different states of India and all the serotypes 1, 2, 3 and 4 were incriminated in these outbreaks. Earlier outbreaks of dengue in India generally occurred in large towns and cities associated with high prevalence of *Aedes aegypti*. But in recent outbreaks, dengue was observed to occur in semiurban as well as in rural areas. This is probably due to the invasion of the vector species to rural areas in accordance with change of ecology and environment. *Aedes aegypti* is thought to be the primary vector of dengue but of late it is seen that *Aedes albopictus* which inhabits all over Southeast Asia and parts of temperate Asia also transmits dengue virus, *Dirofilaria immitis* (Dog heart-worm) and other pathogens (Hanson et al., 1993). *Aedes albopictus* is also known to transmit Chikungunya, JE and LaCrosse (LAC)

virus in the laboratory (Rai, 1986; Bang and Shah, 1988). In the Northeastern region of India, although no major outbreaks of dengue has been observed, but there is considerable serological evidence of dengue virus activity in this region (Rodrigues and Dandawate, 1977; Baruah and Mahanta, 1996; Baruah et al., 1996) to cause any epidemic with the prevalence of vector mosquitoes.

INVESTIGATIONS

Entomological investigations were made in urban, industrial and semiurban areas of N.E. Region of India particularly in the state of Assam, Nagaland, Arunachal Pradesh, Meghalaya. Different container habitat types were searched and water samples from containers positive for mosquito breeding were taken separately and recorded. Mosquitoes emerging out of larvae were identified in laboratory. Prevalence pattern of different *Aedes* species as well as breeding potential of these species in different containers (Container Index value) reveal that both *Ae aegypti* and *Ae albopictus* breed artificially created man made environmental situations. In urban and industrial environment, the breeding of both these vectors are common and percentage of prevalence for *Ae aegypti* is considerably higher than that of *Ae albopictus*. Whereas in semiurban environment having vegetations etc., *Ae albopictus* is the dominant species (Fig. 1).

Keeping or storing solid wastes carelessly in open condition facilitates accumulation of rainwater in them followed by profuse breeding of *Aedes* mosquitoes (Fig. 2). Thus, many of these form the permanent breeding habitats. Due to rapid urbanization and increase in road traffic, roadside garages and temporary vendors are coming up in N.E. Region of India. In every township and suburban areas, the tyre repairing

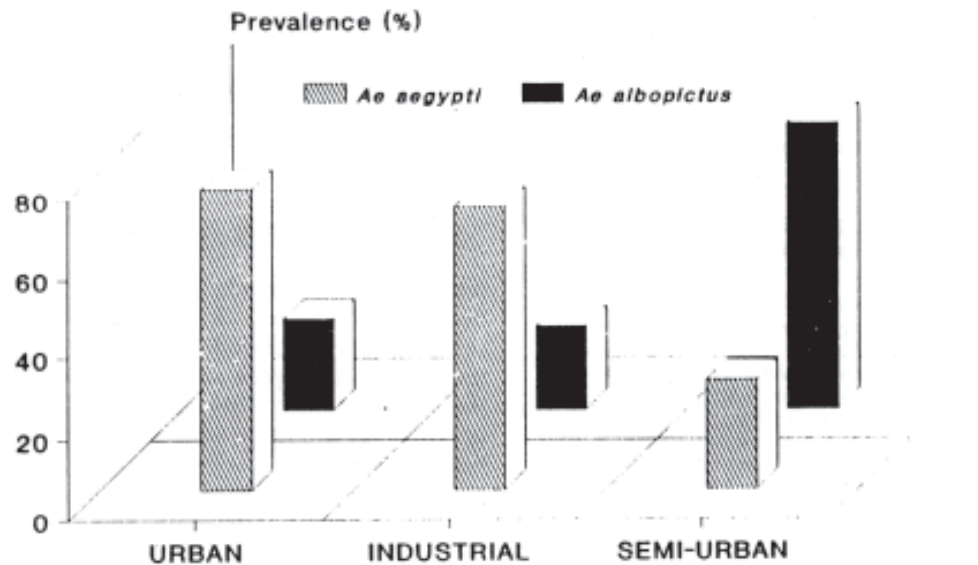


Fig. 1. Prevalence of potential dengue vectors in different environmental situations

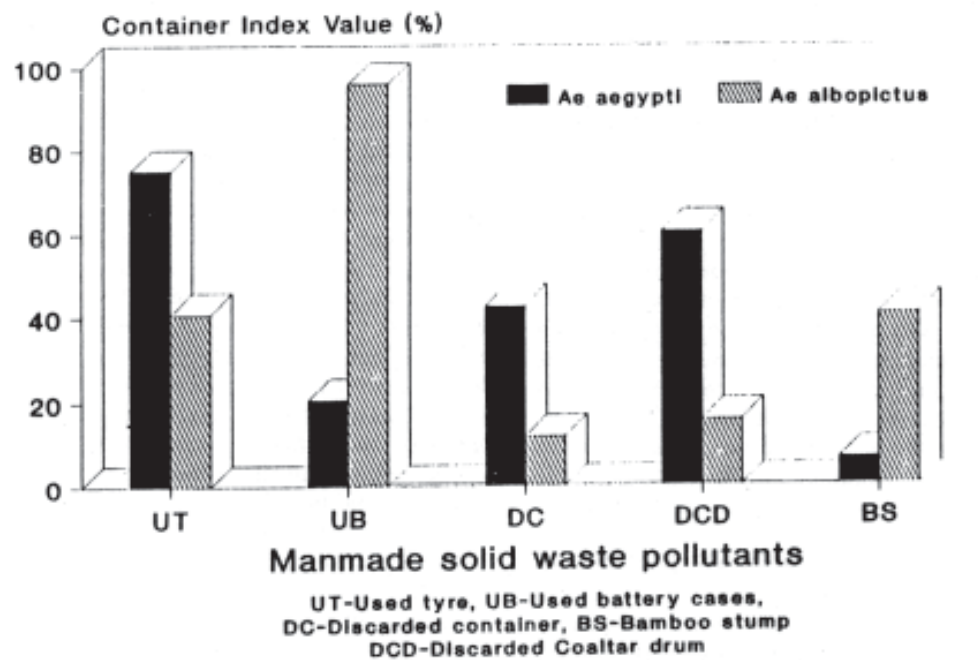


Fig. 2. Manmade solid waste pollutants and dengue vector breeding potential

shops associated with motor garages contribute to a large number of *Aedes* population in the locality. Eggs of *Aedes* can withstand desiccation even up to one year if the temperature is not very high. Temperature of NE Region is congenial for this purpose. Movement of old tyres and used battery cases also contribute to the spread of these container breeding mosquitoes to newer areas. Moreover, the transportation of used tyres or battery cases from dengue endemic zones can carry the desiccated eggs of these mosquito species along with the virus to spread the infection as transovarial transmission has been documented in dengue (Khin and Than, 1983; Rosen et al., 1983). The bamboo stumps used in fencing the dwelling houses, discarded open container including paper cups/earthenware, used coal tar drums and coconut shells are also found positive for *Aedes* breeding. Thus, human ecology is involved in creation of a mosquitogenic environment.

Air-coolers which are found to be potential breeding habitats of dengue vectors in other parts of the country are uncommon in cities and towns of Northeast Region of India, instead man made environment has been implicated for creation of dengue vector breeding habitat types in this region.

It is observed that man is directly or indirectly involved in creation of a mosquitogenic environment particularly for container breeder dengue vectors and considering the danger out of it, it is indeed a needful act of the administra-

tive authority/local Municipal bodies to give attention for proper storage or disposal of the solid wastes and also act of health policy makers to arrange for imparting health education for gaining community participation in regards to conservation of a healthy environment. The control and management of DEN/DHF always rely on environment management, sanitation, legislative measures and community participation.

REFERENCES

- Bang, Y.K. and Shah, N.K.: Human ecology related to urban mosquito borne diseases in countries of Southeast Asian Region. *J. Commun. Dis.*, **20**(1): 1-17 (1988).
- Baruah, H.C. and Mahanta, J.: Serological evidence of dengue-2 activity in Assam and Nagaland. *J. Commun. Dis.*, **28**(1): 56-58 (1996).
- Baruah, H.C., Mohapatra, P.K., Kire, M., Pegu, D.K. and Mahanta, J.: Haemorrhagic manifestations associated with dengue virus infection in Nagaland. *J. Commun. Dis.*, **28**(4): 301-303 (1996).
- Hanson, S.M., Mutebi, J.P., Craig, G.B.Jr. and Novak, R.J.: Reducing the over wintering ability of *Aedes albopictus* by male release. *J. Am. Mosq. Control. Assoc.*, **9**: 78-83 (1993).
- Khin, M.M. and Than, K.A.: Transovarial transmission of dengue-2 virus by *Aedes aegypti* in nature. *Am. J. Trop. Med. Hyg.*, **32**: 590-594 (1983).
- Rai, K.S.: Genetics of *Aedes albopictus*. *J. Am. Mosq. Control Assoc.*, **7**: 429-436 (1986).
- Rodrigues, F.M. and Dandawate, C.M.: Arthropod borne viruses in northeastern region of India: a serological survey of Arunachal Pradesh and Assam Indian. *J. Med. Res.*, **65**: 453-465 (1977).
- Rosen, L., Shroyer, D.A., Test, R.M., Freier, J.E. and Lien, J.C.: Transovarial transmission of dengue viruses by mosquitoes: *Aedes albopictus* and *Ae. aegypti*. *Am. J. Trop. Med. Hyg.*, **32**: 1108-1119 (1983).