

## Comprehensive Environmental Management Measures Controlled Dengue Virus (DENV) in an Endemic Region

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Sir,

DENV is responsible for infecting about 50-100 million people worldwide causing approximately half a million life threatening complications like dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS).<sup>1</sup> According to the National Vector Borne Diseases Control Programme (NVBDCP), dengue fever (DF) in India is progressively increasing from 3306 cases in 2001 to 50222 cases in 2012; deaths have risen from 53 in 2001 to 242 in 2012.<sup>2</sup>

From NE India first DF was reported from Pasighat, East Siang district of Arunachal Pradesh in 2012 where DENV-3 was predominant serotype along with DENV-1 and DENV-2,<sup>3</sup> subsequently in 2014 all four DENV serotype were detected. Although since 2012 DF has been reported recurrently from Pasighat during June to Nov 2015 a major outbreak of DF occurred in Pasighat and it was established that the region as dengue endemic. A total of 6460 suspected cases with pyrexia were screened for dengue during June to Nov 2015. Among the screened samples, 1755 and 138 cases were positive for DENV NS1 and IgM Ab respectively. An epidemiological survey was carried out and a subset of 613 cases were further analysed. The median age of the subset was 25 years (SD ± 14.3 years, age range between 7 days to 82 years; intra quartile age range of 17-38.5 years) and females accounted for 55.8%. Among the subset, 91 and 28 were positive for NS1 Ag and IgM Ab respectively. The prevalence of dengue infection among both the genders was similar (M=18.8% F=19.6%). The prevalence of DENV pyrexia was 2.9%, 27.8%, 57.4% and 11.8% in the age group of ≤5 years, >5 to ≤18 years, >18 to ≤45



**Fig. 1:** Shows mosquito larvae in rainwater accumulated in a hollow bamboo stump (A), fogging is done to control adult mosquitoes (B) and open rainwater accumulation sites have been covered with mud or sand (C and D)

years and above 45 years respectively ( $p=0.29$ ). NS1 positive samples were analyzed by RT-PCR assay followed by serotyping and DENV type 1 was found to be predominant along with sporadic DENV type 2.

Further, investigation revealed that enhanced breeding sites (Figure 1A), presence of the vectors along with elevated temperature due to the effect of El Nino episodes with maximum mean temperature rising above 30°C (May-Oct 2015). Moreover, it is known that the mean extrinsic incubation period for DENV shortens from 15 days at 25°C to 6.5 days at 30°C,<sup>4</sup> these factors may have triggered major outbreak of DENV in Pasighat. Looking into the quantum of DENV infection, in the month of August 2015, the district administration, Pasighat implemented a comprehensive multi-functional environmental management measures and the state health authorities devised the technical organization and inspection. A demographic map of the effected villages and houses

was prepared. Different organisation including district health authorities, district civil administration and city municipality were involved. Integrated intervention measures were emphasised which includes eradication of the breeding sites (clearing blocked gutters, street drains, and unnecessary container/tyres), regular fogging for killing adult mosquitoes (Figure: 1B), public awareness programs and regular screening of the suspected cases, as well as rigorous administrative surveillance. Hoardings on dengue prevention and control were displayed in all the public places, including hospitals, schools, parks, public squares and tourist sites. Moreover, bamboos being integral part of the local population (*Adi* tribes), special emphasis was specified to fill the bamboo stumps, clefts, holes and crevice with soil or mud, to stop rain water accumulation (Figure 1C and 1D).

The mentioned efforts showed significant reduction in the reported DENV cases. The environmental management system was continued

throughout the year 2016 also; as a result out of 1136 symptomatic cases screened for DENV during 2016 only 8 cases and 21 cases were positive for DENV NS1 Ag and IgM Ab respectively and found to be DENV type 1. In the absence of a safe and effective tetravalent vaccine for dengue viruses, environmental management measures are the most effective method to prevent vector borne diseases. Hence public awareness activities combined with continuous monitoring is required to eliminate the identified risk factors for vector breeding could be instrumental in prevention of

further outbreaks. With the increasing importance of mosquito borne diseases like Dengue, Chikungunya, Yellow fever, Malaria, Zika etc, the authors envisage that the comprehensive environmental management measures, or modifications of it, will become increasingly important in coming days.

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#### **References**

1. Whitehorn J, Farrar J. Dengue. *Br Med Bull* 2010; 95:161-73.
2. Chaudhuri M. What can India do about dengue fever? *BMJ* 2013; 346:f643.
3. Khan SA, Dutta P, Topno R, Soni M, Mahanta J. Dengue Outbreak in a Hilly State of Arunachal Pradesh in Northeast India. *Scientific World J* 2014; Volume 2014, Article ID 584093, 6 pages.
4. Chan M, Johansson MA. The incubation periods of Dengue viruses. *PLoS ONE* 2012; 7.