Correspondence

Mapping dengue cases through a national network of laboratories, 2014-2015

Sir,

Dengue fever, a mosquito-borne viral disease, is a major public health problem globally[1]. It has been estimated that more than 390 million dengue infections occur every year, of which 96 million manifest clinically[2,3]. India contributes to about a third of global burden of apparent dengue infections[2,3]. As per India's Integrated Disease Surveillance Programme, more than 100 dengue outbreaks were reported in 2015[4]. Good laboratory-based disease surveillance is essential for early detection of dengue outbreaks and implementation of effective preventive and control measures[1].

Department of Health Research (DHR) and Indian Council of Medical Research (ICMR), Government of India, have established Virus Research and Diagnostic Laboratory Network (VRDLN) to strengthen the laboratory capacity in the country for providing timely diagnosis of disease outbreaks[5]. The fully functional network would consist of 120 laboratories at the medical college level, 30 State level and 10 regional level laboratories[5]. VRDLs receive samples from the district public health authorities for laboratory confirmation of disease clusters (suspected outbreaks). Besides, providing diagnosis to disease outbreaks, VRDLs also provide virological diagnosis to patients seeking healthcare at the medical colleges where VRDLs are located. In January 2016, 34 VRDLs (24 medical college level, 5 State level and 5 regional level) were operational established in 23 Indian States. VRDLs, which follow a uniform protocol for laboratory testing, have a facility to test up to 27 viral aetiologies (hepatitis: hepatitis A, B, C and E; arboviruses: Japanese encephalitis, West Nile, dengue, chikungunya, Chandipura virus and Kyasanur Forest Disease; respiratory viruses: influenza, parainfluenza, RSV, adenovirus, rhinovirus; fever with rash: measles, rubella, varicella zoster, mumps and parvovirus B 19; herpesvirus family: EB virus, herpes simplex virus and cytomegalovirus; enteric viruses: rotavirus, enteric adenoviruses, norovirus and astrovirus).

In this study, the laboratory surveillance data collected by VRDLN from January 2014 to December 2015 were analysed at the ICMR-National Institute of Epidemiology, Chennai, India, to describe the epidemiology of dengue fever in India. Between January 2014 and December 2015, VRDLs received samples from 205 suspected outbreaks (70 in 2014 and 135 in 2015) for laboratory diagnosis; 42 of which were due to dengue (13 in 2014 and 29 in 2015). A total of 4952 patients from these 42 clusters were investigated for IgM antibodies or NS1 antigen against dengue virus and 2442 (49.3%) were found positive (Table). The dengue clusters were reported from 39 districts of 12 Indian States (Figure). Most of the clusters reported in 2015 were from States of Rajasthan (n=6), Tamil Nadu (n=4), Odisha (n=4), Jharkhand (n=4), Punjab (n=3) and Assam (n=3). Twenty nine of the 42 clusters occurred during 33-48 wk of the calendar year corresponding to August-November months.

In addition, during 2014 and 2015, VRDLs investigated 40,225 febrile patients attending the medical colleges that housed the VRDLs for dengue, of whom, 10,183 patients (25.3%) were sero-positive. Suspected and confirmed dengue cases increased from the month of June and peaked in the month of October (data not shown).

During this two year period, a total of 12,625 (2442 from suspected outbreaks and 10,183 amongst patients attending medical colleges) laboratory-confirmed dengue cases were diagnosed by the VRDLN. Nearly two-third of these cases were in the age group of 15-45 yr, whereas 23.6 per cent of the cases were reported amongst children aged ≤14 yr (Table). About two-third of the positive cases were males (67 vs. 33%, $P<0.001$, Chi square test) and male preponderance was observed in all the age groups (<1 yr: males=237, females=151,

Table. Details of dengue fever cases investigated by VRDLs during 2014-2015, with age and sex distribution of dengue positive patients

| Details	2014	2015	Total
Number of VRDLs established (functional)	20	34	-
Number of VRDLs reporting dengue cases	18	33	-
Suspected outbreaks/clusters			
Number of dengue outbreaks diagnosed	13	29	42
Number of patients investigated	806	4146	4952
Number of patients positive for dengue (%)	203 (25)	2239 (54)	2442 (49.3)
Patients attending medical colleges			
Number tested for dengue virus	9379	30,846	40,225
Number positive for dengue (%)	1741 (19)	8442 (27)	10,183 (25)
Age group in yr (n=12,625) (%)			
≤1	19 (1.0)	369 (3.5)	388 (3)
2-5	130 (6.7)	531 (5.0)	661 (5)
6-14	308 (15.8)	1601 (15.0)	1909 (15)
15-45	1241 (63.8)	6878 (64.4)	8119 (64)
>45	241 (12.4)	1256 (11.8)	1497 (12)
Not known	5 (0.3)	46 (0.4)	51 (1)
Sex (%)			
Male	1322 (68)	7126 (66.7)	8448 (67)
Female	622 (32)	3555 (33.3)	4177 (33)
Total	1944 (15)	10,681 (85)	12,625 (100)
VRDLs, Virus Research and Diagnostic Laboratories			
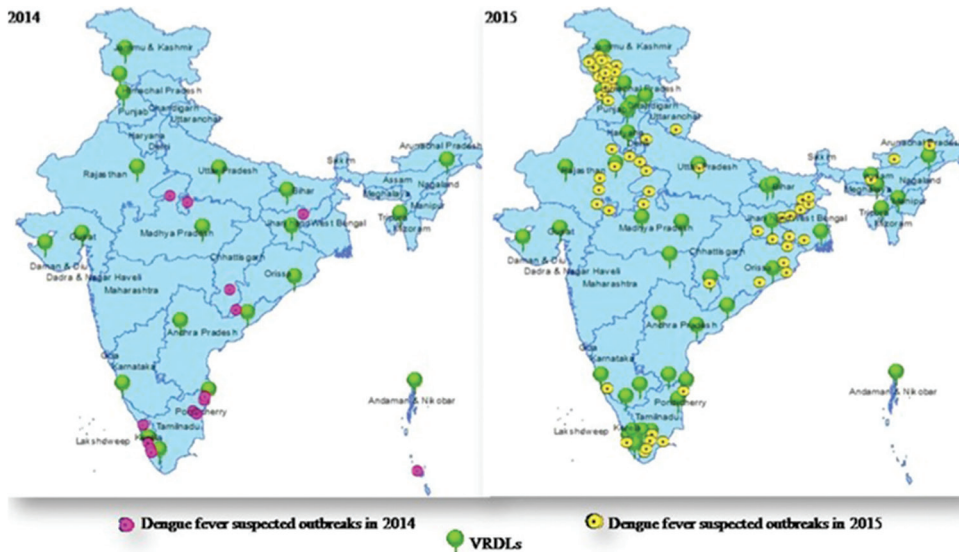
Figure. Distribution of dengue fever outbreaks diagnosed by VRDLs in 2014-2015. [Maps generated through ESRI ArcGIS Desktop: Release 9.2. software (Redlands, CA, USA)].

P<0.001; 2-5 yr: males=404, females=257, *P*<0.001; 6-14 yr: males=1187, females=722, *P*<0.001; 15-45 yr: males=5707, females=2412, *P*<0.001; >45 yr: males=876, females=621, *P*<0.001). This pattern of male predominance was consistent with the reports from several other countries and could be on

the account of (*i*) greater exposure of males to dengue-carrying mosquitoes, or (*ii*) differences in the health-seeking behaviour of males and females[5-7].

Our analysis had certain limitations. The analysis was based on the data collected from patients seeking care at the medical college hospitals covered under VRDLN and might not be generalizable to the entire country. Although the network collected information about the basic epidemiological characteristics (time: date of onset of illness and date of seeking care; place: village, subdistrict/*tehsil* and district; person: age, sex and clinical presentation), information about haematological investigations and outcome was not available. In spite of these limitations, the data generated by this network were useful to describe the epidemiology of dengue, which was one of the most common viral diseases prevalent in different parts of India. The data from the network indicated that dengue fever was the most common viral aetiology investigated by the VRDLs during 2014 and 2015.

In India, the laboratory capacity for diagnosis of outbreaks under Integrated Disease Surveillance Programme is limited[8]. The VRDLN aimed to provide timely diagnosis of disease outbreaks in the country, can be considered as a complementary effort. It is important to note that VRDLN investigated 205 disease clusters during 2014-2015, of which 42 were due to dengue fever. This network also generated case-based data on dengue fever to understand its epidemiology. Dengue serotype surveillance is important, as large dengue outbreaks tend to follow changes or re-introductions of serotypes[9]. In India, systematic dengue serotype surveillance is not conducted. The VRDLN may provide a unique opportunity for systematically generating dengue serotype information in future.

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Conflicts of Interest: None.

**Vasna Joshua[1], Manoj V. Murhekar[1,*], M. Ashok[1],
K. Kanagasabai[1], M. Ravi[1], R. Sabarinathan[1],
B. K. Kirubakaran[1], V. Ramachandran[1],
Nivedita Gupta[2] & Sanjay Mehendale[1]**
[1]ICMR-National Institute of Epidemiology,
Chennai 600 077 & [2]Division of Epidemiology and
Communicable Diseases, Indian Council of Medical
Research, New Delhi 110 029, India
For correspondence:
mmurhekar@gmail.com

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