Entomological indicators during transmission season of dengue in Silvassa (India)

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Abstract The entomological surveillance was conducted in urban, semi-urban/slum, industrial and residential areas during main transmission period from June to November 2012. In residential sites house index was 41.7–35.0, breteau index 71.7–136.7 and container index 11.6–20.2. During transmission period all the values were much higher than the threshold level. The causes of high values of entomological indicator appeared to be rapid industrialization, unawareness of the conditions or factors that can exacerbate mosquito breeding, water storage habits in community and un-implementation of health related legislation.

Keywords Entomological indicators · Dengue · *Aedes*

Introduction

Dengue is a worldwide public health problem throughout the tropical and subtropical zones. It is endemic in south-east Asia; the Pacific; east and West Africa; the Caribbean and the Americas. Dengue fever (DF) and dengue haemorrhagic fever (DHF) are emerging as major public health

problems in India and are reported from more than 19 states. *Aedes aegypti* and *Ae. albopictus* are the principal vectors of dengue fever, widely prevalent in India. Dengue virus has been recently detected in Skuse, an urban area, now has spread to rural areas and started spreading in areas which were so far free from this disease. Silvassa is an urban area (surrounded by 72 villages) located at Latitude-20 ° 2' 51"N–20 ° 21' 36"N, Longitude-72 ° 54' 41"N–73 ° 13' 13"N. Rapid industrialization and multistate migration poses an increased risk of vector-borne diseases, including dengue fever (DF) and DHF in the Union Territory (UT) of Dadra & Nagar Haveli.

Selected workers have indicated the entomological investigation on the vectors of dengue in different part of India e.i., Tamil Nadu (Kader et al. 1998 and Balakrishnan et al. 2006); Maharashtra (Ilkal et al. 1991 and Padbidri et al. 1996); Gujarat (Mahadev et al. 1993); Delhi (Nandi et al. 2008); Uttarakhand (Singh et al. 2010); North, North-east and central India (Kalra et al. 1997); North India (Kumar et al. 2001) and South India (Tewari et al. 2004). Workers like Dibo et al. 2008; Fávaro et al. 2008 and Steffler et al. 2011 have established positive correlation relation between entomological indicators and incidence of dengue fever.

There is no published information or literature on the entomological indicator in Union territory of Dadra & Nagar Haveli. The present report furnishes information on the entomological indicators and breeding preference of *Aedes* in different areas of Union territory of Dadra and Nagar Haveli.

Material and methods

Monthly entomological surveillance was performed in two sentinel sites (Dadra and Masat) and two random sites

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(Urban, semi-urban/slum and industrial) during the transmission period from June to November 2012. All kinds of breeding habitats in the study area (e.g. cemented tubs/tanks, overhead tanks, plastic containers, iron/metal drums, junk materials, desert coolers, discarded tyres, coconut shells and curing tanks, etc.) were screened with the help of flash-light and pipette, while bigger containers were searched with the help of a dipper of 300 ml capacity (having white background for better visibility). The type of breeding habitats and their locations were noted. The data on larval survey were analyzed and calculated in terms of different indices like container index (CI), house index (HI) and breteau index (BI) as per the (WHO 1975 and 2003) procedure and Focks (2003). *Aedes* identified up to species level with the help of standard identification keys (Das and Kaul, 1998).

Result and Discussion

A total of 120 houses (60 each in sentinel and random sites) were monthly searched for *Aedes* breeding in all kinds of (temporary and permanent water) bodies both indoors and outdoors in all the residential and commercial areas of the town. The overall HI, CI and BI in residential area were 35.0–48.3; 11.6–20.2 and 71.7–136, respectively (Table 1). Likewise the value of CI in industrial areas were 9.2–65.3 during transmission season of dengue (Table 2). Among all the habitats, highest positivity of *Aedes* larvae was recorded in plastic drums/tanks/tubs (33.8 %), followed by tin containers (26.96 %); others like coconut shells and junk material etc. (24.6 %); cooler (14.0 %); tyres (12.9 %); cement tank (10.4 %) and clay pots (9.1 %) in residential area (Table 3). In case of industrial area, the highest positivity of *Aedes* was recorded in plastic drums/tanks/tubs (44.7 %) followed by tiers (34.6 %); tin containers (32.2 %); cement tanks (27.2 %); coconut shells; junk material etc. (23.1 %); clay pots (16.0 %) and coolers (14.0 %) (Table 3). In addition, breeding was also observed in daubers, overhead tanks, old discarded plastic shoes, junk materials, flower vases, cemented tanks/tubs

and metal containers and curing tanks during the survey (Table 4). The result of present study conform to those observed by previous workers like Balakrishnan et al. (2006) in Tirpura, Nandi et al. (2008) in Delhi and Singh et al. (2010) in Haldwani.

All the entomological indices were found above the critical level and potential cause of this seems to be the commercial using of plastic containers in industries and compulsion of storing water in different containers without cover in residential colony and slum, to meet the acute shortage of water in the area. The residents might not be aware of the conditions or factors that can exacerbate mosquito breeding. The indoors were rarely cleaned and remain undisturbed most of the time, resulting in high breeding of *Aedes* mosquitoes. Water storage habits were found as one of the factors responsible for high *Aedes* breeding. It necessitates the appropriate measures to control the outbreak of dengue in these affected localities. The *Aedes* infestation cannot be successfully controlled without the involvement and co-operation of the community and implementation of health related legislation. Therefore, a sustainable approach should include the mass education, community participation, a regular provision of adequate water supply to communities and strict implementation of health related legislation.

Table 1 Showing the prevalence index of *Aedes* species in residential colony of Silvassa during transmission season of dengue during 2012

Month	No. of house served	No. of house positive	No. of container searched	No of container positive	HI	CI	BI
June	60	25	371	43	41.7	11.6	71.7
July	60	28	383	56	46.7	14.6	93.3
August	60	29	407	72	48.3	17.7	120.0
September	60	28	405	82	46.7	20.2	136.7
October	60	26	379	52	43.3	13.7	86.7
November	60	21	378	47	35.0	12.4	78.3

Table 2 Showing the prevalence index of *Aedes* species in industrial area of Silvassa during transmission season of dengue during 2012

Month	No. of industries served	No. of industries positive	No. of container searched	No of container positive	CI
June	5	5	656	107	16.3
July	5	5	733	225	30.7
August	5	5	642	411	64.0
September	5	5	403	263	65.3
October	5	5	190	62	32.6
November	5	5	262	24	9.2

Table 3 Showing positivity rate of *Aedes* in different type of breeding sites in residential colonies

Name of breeding site	Name of month						
	June	July	August	Sep	Oct	Nov	Mean
Tyres	7.1	12.2	17.8	29.5	2.2	8.4	12.9
Coolers	20.0	18.3	21.4	24.3	0.0	0.0	14.0
Tin containers	16.4	17.4	22.2	34.6	35.0	36.0	26.9
Cement tanks	0.0	16.7	10.4	21.3	7.1	7.1	10.4
Clay pots	6.6	4.9	2.5	11.9	20.2	8.3	9.1
Plastic containers	19.5	29.2	34.5	51.1	38.9	29.7	33.8
Other	8.5	20.7	33.2	38.1	21.2	25.9	24.6

Table 4 Showing positivity rate of *Aedes* in different types of breeding sites in industrial areas

Name of breeding site	Name of month						
	June	July	Aug	Sep	Oct	Nov	Mean
Tyres	20.5	32.8	75.0	26.3	42.9	10.0	34.6
Coolers	14.3	50.0	0.0	0.0	0.0	20.0	14.0
Tin containers	16.3	32.9	54.2	60.4	21.6	6.5	32.0
Cement tanks	22.2	35.7	35.0	25.0	28.6	16.7	27.2
Clay pots	9.0	15.0	24.1	21.7	22.7	3.7	16.0
Plastic containers	27.3	39.3	72.1	76.7	43.2	9.8	44.7
Other	7.3	25.7	42.0	32.1	21.4	10.0	23.1

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