

Aedes aegypti indices and KAP study in Sangam Vihar, south Delhi, during the XIX Commonwealth Games, New Delhi, 2010

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Abstract

Dengue fever (DF) cases were reported in Delhi during August 2010. As the XIXth Commonwealth Games were to be held in Delhi in October 2010, entomological and community knowledge, attitude and practices (KAP) studies were carried out to assist the Municipal Corporation of Delhi (MCD) for better implementation of vector control activities in the city. A total of 495 houses were searched for *Aedes aegypti* breeding in all kinds of temporary and permanent water receptacles in both indoors and outdoors in a thickly-populated, illegally-constructed locality, named Sangam Vihar, in south Delhi. The overall House Index (HI), Container Index (CI) and Breteau Index (BI) were 44.44%, 19.01% and 91.92 respectively. For KAP, a pre-tested, structured questionnaire was used for data collection. Out of the 384 households surveyed, 156 were aware about dengue and only 12 households knew that virus was the causative agent for DF. A majority (378) of the households practised water storage and 48 of them stored water for more than one week. No preventive/control measures were adopted to prevent mosquito breeding in the water-holding containers by a majority of the households (45.57%). 57% of them did not know the biting habits of dengue vector mosquitoes.

The results of the study indicated that the community's knowledge about dengue fever, its transmission, vector breeding sources, biting habits and preventive measures was poor.

Keywords: Dengue; *Aedes aegypti* indices; Knowledge Attitude and Practices (KAP); Delhi.

Introduction

Delhi is endemic for dengue fever (DF)/dengue haemorrhagic fever (DHF) and has experienced several outbreaks of DF/DHF since 1967.^[1] In the recent past, an outbreak of DF/DHF was recorded in 1996 which was most severe and resulted in more than 10 252

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hospitalizations and 423 deaths. All four dengue serotypes (DENV 1–4) are circulating in the country.^[2-3]

India hosted the XIX Commonwealth Games in Delhi from 3–14 October 2010. The government expected a heavy influx of athletes and visitors during this period. In a bid to prevent any upsurge of dengue, the Municipal Corporation of Delhi (MCD), which is the agency mainly responsible for the control of vector-borne diseases, made elaborate arrangements for the control of DF/DHF through public-private partnership (PPP), behavioural change communication (BCC) and capacity-building activities.

To assist the MCD, the Ministry of Health and Family Welfare, Government of India mobilized the services of scientists from two research institutes, viz. the National Institute of Malaria Research (NIMR) under the Indian Council of Medical Research (ICMR) and the National Centre for Diseases Control (NCDC), Ministry of Health and Family Welfare, all located in Delhi, to undertake cross-check work for better implementation of vector control activities. It was in that context, NIMR conducted the cross-check work in Sangam Vihar, an area in south Delhi, known for the endemicity of DF/DHF. The activities covered an assessment of *Aedes aegypti* indices and knowledge, attitude and practices (KAP) study in the area which is a prerequisite for social mobilization and dengue prevention and control.^[4] The cross-check of indices were communicated to MCD for remedial action on a daily basis.

Materials and methods

Study area

Delhi, with an area of 1485 sq km is located at 28.38° North latitude and 77.12° East longitude. The climate of Delhi city is most varied. The lowest temperature ever recorded was 2°C and highest 45°C, while relative humidity (RH) ranges from 20% to 86%. Delhi on an average receives a rainfall of 212 mm during the rainy season (July to October). Sangam Vihar is a part of the Central zone of MCD and the population of this area is about 400 000. This locality has been built unauthorisedly, and those living in such settlements do not receive piped water supply from Delhi Jal Board (DJB), the official agency responsible for the supply of water to the city. The residents of Sangam Vihar, therefore, have to procure water from private sources. They usually store water in overhead tanks (OHT) and ground-level collection tanks (GLCT).

Entomological indices

A door-to-door survey was carried out in houses and in peri domestic areas to detect *Ae. aegypti* breeding. The *Aedes* species was identified following Das and Kaul's key.^[5] Entomological indices were collected as per sample size and techniques contained in the WHO-SEARO guidelines.^[6]



Knowledge, attitude and practices (KAP)

In selected households, door-to-door visits were made to fill up interview schedules (IS) which emphasized four items: (i) knowledge on the causative agent of DF and mode of its transmission; (ii) vector mosquito behaviour; (iii) community behaviour on water storage; and (iv) mosquito control methods. A pre-tested, structured questionnaire was used for data collection. The multistage cluster systematic method was applied. In the selected households, mostly the head of the family or a member were interviewed after getting prior consent. Of the 495 selected households, the IS could be filled up from 384 households only, the others found locked at the time of visit. The study was carried out from 15 September to 15 October 2010.

Results

Aedes aegypti indices

A total of 495 houses in 21 localities were searched for *Ae. aegypti* breeding in all kinds of water-holding receptacles kept both indoors and outdoors (open space inside the house premises), of which 220 were found positive (Table 1). The House Index (HI), Container Index (CI) and Breteau Index (BI) were 44.44%, 19.01% and 91.92 respectively. HI ranged from 14.29% to 90%, CI ranged from 2.68% to 59.26% and BI ranged from 20 to 230. The breeding preference ratio (BPR) was observed the highest (2.38) in discarded materials lying outdoors, followed by evaporation room coolers (1.22), mud-pots (1.02) and domestic small-to-large containers (0.87) placed indoors, respectively (Table 2). Maximum breeding (35.82%) was detected in domestic storage (small-to-large) containers, followed by discarded materials containing water (23.74%) and evaporation room coolers (16.04%). Discarded tyres were found to be the least breeding habitats (3.73%). The results revealed that, out of the 2394 water containers searched, 455 were found positive. Of the 401 overhead tanks (OHTs) checked, 53 were found positive for *Ae. aegypti* breeding. Consumer items like broken mud-pots and glassware and iron scraps were the most common items supporting the breeding of *Ae. aegypti*. In addition, breeding was also observed in flower vases, old and discarded plastic shoes, discarded/broken plastic items and other sites such as pick-holes of manhole covers, plastic sheds, plastic bags and tea cups.

KAP

Table 3 shows the water storage practices in the households studied. The majority (61.98%) of the households used small plastic and iron containers for water storage and 38.02% of them used large containers. Only 12.5% of the households said that they stored water for more than five days, while 1.6% of them said that they were getting sufficient water through borewell and hence they did not require water to be stored for longer periods.



Table 1: *Aedes aegypti* indices in Sangam Vihar, New Delhi

Localities searched block-wise	Houses visited	Houses positive	Containers searched	Containers positive	HI	CI	BI
I-Block, slum colony	20	18	224	46	90.0	20.54	230.00
G-II/Street no. 18	21	8	105	16	38.10	15.24	76.19
F-I/Street no. 7	21	3	78	5	14.29	6.41	23.81
K-I/Street no. 18	22	9	83	15	40.91	18.07	68.18
K-I/Bakari colony	21	3	86	15	14.29	17.44	71.43
J-II/Street no. 7	20	4	79	6	20.00	7.59	30.00
I/Street no. 10/21	21	10	97	21	47.62	21.65	100.00
I/Street no. 18	21	15	226	56	71.43	24.78	266.67
D-II/Street no. 2	20	3	77	4	15.00	5.19	20.00
J-I&II/Gupta colony	21	9	71	15	42.86	21.13	71.43
F-I Block	20	4	91	7	20.00	7.69	35.00
G-II/Street no. 19	20	14	95	24	70.00	25.26	120.00
F-II/E-7&D-5	10	2	27	3	20.00	11.11	30.00
I-Block/Street no. 4	20	13	91	24	65.00	26.37	120.00
J-I/Street no. 6&7	20	4	149	4	20.00	2.68	20.00
K-I/18D&19	20	7	113	13	35.00	11.50	65.00
K&I Block	21	12	110	31	57.14	28.18	147.62
E-6& D-5	25	12	191	36	48.00	18.85	144.00
I-II-Block	18	11	203	20	61.11	9.85	111.11
D-5, E-6&7	59	27	144	62	45.76	43.06	105.08
KI-18, K-19	54	32	54	32	59.26	59.26	59.26
Total	495	220	2394	455	44.44	19.01	91.92



Table 2: Breeding Preference Ratio (BPR) of *Ae. aegypti* in different breeding habitats in Sangam Vihar, New Delhi

Type of breeding habitats		Number of containers with water				Breeding Preference Ratio
		Examined	(X%)	With larvae	(Y%)	BPR (Y/X)
Outdoor (Peridomestic)	Discarded materials (viz. old plastic/glass bottle/iron scrap)	239	9.98	108	23.74	2.38
Indoor (Domestic)	Mud-pots	98	4.09	19	4.17	1.02
	Discarded tyres	103	4.30	17	3.73	0.87
	Domestic containers (Small and Large)	1080	45.11	163	35.82	0.79
	Evaporation coolers	315	13.16	73	16.04	1.22
	*OHWTs	401	16.75	53	11.65	0.70
	**GLCTs	158	6.67	22	4.83	0.73
Total		2394		455		

*OHWT= Overhead water tank; **GLCT= Ground-level cement tank.

Table 3: Community behaviour about water storage practices for dengue control in Sangam Vihar, New Delhi

Parameter	Type of container	No. surveyed (384)	% used for water storage
Type of domestic containers used by the community for storage	Small containers (less than 25 litres)	238	61.98
	Large containers (more than 25 litres)	146	38.02
Duration of water storage in domestic water-holding containers	1-2 days	188	48.96
	3-5 days	142	36.98
	> 5 days	48	12.5
	Do not store	6	1.6



A total of 384 households were interviewed and their demographic details are shown in Table 4. 77.07% of the respondents had education up to the undergraduate level, 8.85% were graduates and 14.06% were illiterate. Of the total households surveyed, 53.38% of the respondents belonged to the below poverty line (BPL) category, while 43.22% belonged to the middle-income level and 3.38% were from the high income group. 46.87% of the respondents were unemployed.

The perception of the community about dengue and its related information is compiled in Table 5. Only 40.62% of the respondents were aware that dengue is transmitted by a mosquito bite, while a majority (56.25%) of them did not know the cause of the disease. Only 3.12% knew that virus is the causative agent for DF. It was observed that the knowledge about DF and its preventive methods was high among the formally-educated group (graduate level) as compared to those educated up to undergraduate level. Of the 384 households, only 13.8% knew that clean water-holding containers contributed to vector breeding. The remaining respondents knew about various other sources of breeding of vector mosquitoes (Table 5). 45.57% of them said that they did not follow any preventive measures to control mosquito breeding. 46.87% of them said that they followed some measures (viz. frequently cleaning the containers and covering them); 5.46% removed the unused materials and unwanted containers (Table 5). The respondents were asked whether dengue could be prevented. About 14% replied that dengue was a preventable disease. The majority of the respondents felt that keeping the surroundings clean and following general hygienic conditions would

Table 4: Demographic characteristics of the community surveyed in Sangam Vihar, New Delhi

Variable	Respondent	No. of HHs surveyed	% HH surveyed
Sex	Male	81	21.09
	Female	303	78.90
Educational status	Illiterate	54	14.06
	Undergraduate	296	77.07
	Graduate	34	8.85
Economic status	Below poverty line	205	53.38
	Middle-income group	166	43.22
	High-income group	13	3.38
Employment	Service professional	156	40.62
	Business/self-employed	42	10.93
	Student	6	1.56
	Unemployed	180	46.87



Table 5: Community knowledge, attitude and practices (KAP) on dengue vector and its control, Sangam Vihar, New Delhi

S. No.	Details	Responses (n= 384)	
		No. of HHs	%
1	Community knowledge on dengue		
	(i) Awareness of dengue fever	156	40.62
	(ii) Virus is the cause of dengue fever	12	3.12
	(iii) Not known	216	56.25
2	Perception of dengue prevention by community		
	(iv) Can be prevented	55	14.32
	(v) Cannot be prevented	21	5.46
	(vi) Not known	308	80.20
3	Methods of dengue prevention adopted by community		
	(vii) Control mosquito by insecticides	16	4.16
	(viii) By taking medical care	9	2.34
	(ix) Keeping environment clean	47	12.23
	(x) Taking medical care and keeping environment clean	5	1.30
	(xi) No response	307	79.94
4	Knowledge on dengue vector breeding and biting behaviour		
	(xii) Aware of day-biting behaviour of mosquitoes	145	37.76
	(xiii) Dengue transmitted by mosquito bite	72	18.75
	(xiv) Dengue mosquitoes breed in clean water	53	13.80
	(xv) Not known	114	29.86
5	Practices of control of mosquito breeding		
	(xvi) Removed unused materials	21	5.46
	(xvii) Did not take control measures in domestic containers	175	45.57
	(xviii) Followed control measures in discarded containers	180	46.87
6	Practices of prevention of mosquito bite during day		
	(xix) Taken measures to avoid mosquito bite during daytime (used net or repellents, etc.)	48	12.5
	(xx) Used fan alone	299	77.86
	(xxi) Did not take any measures during daytime	37	9.63



help prevent occurrence of the disease. 56.25% had poor knowledge about dengue, while 12.23% said that keeping the environment clean could help to prevent dengue fever and 14.32% had only moderate knowledge about dengue.

A total of 37.76% knew that dengue-transmitting mosquitoes bite during daytime while 62% did not know the biting behaviour of *Ae. aegypti* (Table 5). Irrespective of the knowledge on dengue vector's biting behaviour, nearly 10% of the households did not adopt any measure to prevent mosquito bites, while 77.86% of them used only fans. About 12.5% took some personal protection measures such as net or repellents, etc.

Discussion

During the survey, varying levels of density of larvae and adult mosquitoes of *Ae. aegypti* were recorded at different sites in the study area. It was observed that unused or discarded containers which were kept in open spaces within the house premises/indoors were rarely cleaned and remained undisturbed most of the time, thus resulting in high breeding of *Ae. aegypti* mosquitoes. Large water-storage containers were found to be the key breeding sites.^[7] *Ae. aegypti* breeding was also found in evaporation room coolers. These evaporation coolers are well known for the breeding of *Ae. aegypti* mosquitoes during the monsoons in Delhi.^[8] But during the present study the positivity of evaporation coolers was low because of the community's practice of continuously refilling/re-introducing fresh water every day.

Our results showed that the majority of the population in Sangam Vihar, New Delhi, has some amount of awareness about dengue fever because of several earlier DF outbreaks in Delhi. In spite of this, *Ae. aegypti* breeding was very common in the study area. This was due to the lack of preventive practices against *Ae. aegypti* mosquito breeding in household containers. In the present study, only 45.57% of community members adopted some kind of vector control measures in domestic water storage containers and 5.46% removed the unused containers/materials. Lack of basic knowledge in the community about dengue and its vector could also be a major cause of the increasing trend of dengue in this thickly populated periurban environment.^[9] In more than half of the area, water was being supplied through water tankers, and in other areas by regular water supply.^[10-11] Large ground-level cemented tanks have been installed in house premises/indoors which are filled with water periodically. These water-storage tanks become ideal breeding sites for *Ae. aegypti* mosquitoes, particularly if water is stored for long durations without proper covers.^[12]

IEC activities

The Municipal Corporation of Delhi (MCD) is undertaking various activities for health education through the print and electronic media, vocal messages, street plays and pamphlets, and by involving schoolchildren, for creating awareness about dengue fever. It was, therefore,



thought prudent to assess the community's perception also about the impact of information education and communication (IEC) activities on their KAP pertaining to water storage and dengue control.

During the survey it was found that fogging operations generally lacked a pre-fogging public information campaign which requires the houses to be kept open for the entry of the fog. Health workers, while interacting with householders, invariably talked about the removal of breeding from room coolers and overhead tanks but did not provide enough information regarding pre-fogging requirements.

This study shows the occurrence of *Ae. aegypti* larvae and adults in Sangam Vihar area in south Delhi during the transmission season. The preventive strategy here needs to be directed at seeking active community participation in containing dengue cases in the future.^[13] The study revealed that although there was some awareness in the community about the breeding of dengue vector inside their premises, there was a lack of perception to eliminate these habitats due to one reason or the other.

Thus, there is a need to provide dependable regular water supply to the communities and education for seeking their participation in destroying the breeding habitats of *Ae. aegypti* mosquitoes, while enforcing stringent legal measures for mosquito control.

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