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Comparison of *Aedes aegypti* breeding in localities of different socio-economic groups of Dehradun, Uttarakhand.

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ABSTRACT: An Entomological survey was carried out in different socio-economic groups of selected localities in Dehradun, Uttarakhand during January to December 2015 with a view to study the prevalence, distribution and stratification of areas for *Aedes* mosquito species. In HIG colony HI were above the critical level during August and September and BI were during June, September and October indicating the risk of dengue outbreak in transmission season.

In all the localities surveyed the plastic containers were maximum followed by tin containers, earthen pots, desert coolers and cement tanks. In LIG colony earthen pots were less in number (19.91%) but it forms highest positive breeding containers for *Aedes* mosquitoes but in MIG colony desert coolers were the most preferred breeding container. In HIG colony plastic and tin containers were the primary breeding containers but the desert coolers and discarded tyres were the most preferred breeding containers and contributing maximum for the breeding of *Aedes* aegypti.

Keywords: *Aedes* mosquitoes, Entomological, Haemorrhagic, Breteau Index.

INTRODUCTION

Dengue fever is commonly known to pose a significant threst to public health, spread throughout tropical and sib-tropical regions of the world (Gubler, 1978). Dengue fever (DF) and dengue haemorrhagic fever (DHF) is a serious arbo-viral infection spread by *Aedes aegypti* and *Aedes albopictus* mosquitoes. More than 50 outbreaks of dengue have been reported in different parts of the country (Halstead, 1980; WHO, 2003). *Ae. aegypti* is the main vector species of DF/DHF in India and is common in most of the urban areas on account of deficient water management, presence of non degradable tyres and long-lasting containers, plastic containers as well as increasing urban agglomerations and inability of the public health community to mobilize the population to respond to the need to eliminate mosquito breeding sites. That is, *Ae. aegypti* breeds almost entirely in man-made water receptacles found in and around households, construction sites, factories etc.

About 40% of the global population is living in the areas where transmission of dengue occurs. An estimated 50 million dengue infections, including 5,00,000 cases of DHF that require hospitalization every year (WHO, 2003). *Ae. aegypti* is prevalent in varying densities in North, North-east and central India (Kalra et al.,1997).

In Uttarakhand the outbreak of dengue was reported for the first time in August, 2009 and confirmed by the Department of health service, Govt. of Uttarakhand from town Lal Kuwan district Nainital. During 2010 a major outbreak of dengue was reported in many districts of Uttarakhand. The total positive cases were 4140 with 8 deaths. Out of 4140, highest cases were

reported from Dehradun (2889) with 2 deaths. Dengue infections are now well established in Dehradun. The prevailing climatic conditions, environmental pollution, rapid urbanization, overcrowding and careless human practices are proving conductive for the rapid breeding of *Aedes* mosquitoes.

MATERIALS AND METHODS

The site selected for the present study is the Doon valley in district Dehradun geographically lies between $29^0$55' and $30^0$30' N latitude, and $77^0$35' & $78^0$20' E longitude. An entomological investigation was carried out in three different income group communities of Dehradun *viz*., lower income group (LIG) colony, Middle income group (MIG) colony and Higher income group (HIG) colony from January to December 2012 in randomly selected localities as per the standard techniques (WHO, 2003). A door to door survey was carried out in houses and peri-domestic area to detect *Aedes* breeding with a view to study the prevalence, distribution etc. All kinds of breeding habitats in the study areas like unused wells, tree holes, iron drums, discarded iron OHTs, tubs, tanks, overhead tanks, iron/metal drums, plastic containers (tubs/ drums/ tanks, plastic containers tea cups), empty battery box, junk materials, desert coolers, discarded tyres, curing tanks, daubers, etc (flower pots, junk materials, broken glass wares, bottles and broken plastic containers wares) were screened for the presence of immature stages of *Aedes* mosquitoes.

The data on larval survey were analyzed and calculated in terms of container index (CI), House index (HI) and Breteau index (BI) as per WHO (2003) guidelines. The container preferences of *Ae. aegypti* breeding were assessed by calculation of Breeding preferences ratio (BPR) as suggested by Sharma (2002). Adult *Aedes* mosquitoes were collected with the help of aspirator and flashlight during morning hours (0800-1000 hrs) from tyres, cement tanks, iron pipes, etc and is identified with the help of standard identification keys (Das and Kaul, 1998).

RESULTS AND DISCUSSION

The result revealed that all type of communities in selected localities spread over Dehradun city were found positive for *Ae. aegypti* mosquitoes. Breeding of *Aedes* mosquitoes was observed in all kinds of temporary and permanent water bodies both indoor and outdoor in residential areas. It is evident from the table 1 that *Aedes* breeding was detected during April to October in LIG and MIG colony. In HIG colony breeding occurs during March to November. No breeding could be detected during November to March in LIG and MIG colony but in HIG colony from December to February. The house index was above 10% in the transmission months August and September in MIG colony and in June to September in HIG colony. The house index in LIG colony was below 10% in all the months. The reason can be attributed to the water storage practices among different communities. Similarly BI in LIG and MIG colony were below critical level (i.e. 20) while it is higher during June (20), September (32) and October (24) in HIG colony. The house index recorded during the study period was less than the critical index but the presence of all type of containers in selected localities can be source of *Aedes* breeding and if proper control measures are not taken the indices can be above the critical index of 10%, indicating impending outbreak.

In LIG colony according to their need containers were emptied frequently and fresh water was filled daily, whereas in MIG and HIG colony there was a habit of storing water in

containers as there was intermittent water supply thus increasing the potential for *Aedes* breeding.

Table 1: Monthly wise House, Container and Breteau index of *Aedes* aegypti

Months	LIG Colony			MIG Colony			HIG Colony		
	HI(%)	CI(%)	BI(%)	HI(%)	CI(%)	BI(%)	HI(%)	CI(%)	BI(%)
Jan	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	4	3.58	10
Apr	2	1.16	3	4	3.1	3	8	4.06	12
May	4	2.5	5	5	2.8	6	8	5.56	15
Jun	4	3.02	4	4	2.6	5	12	4.62	20
Jul	6	3.10	7	8	1.04	12	12	4.28	18
Aug	6	3.21	10	10	1.54	10	14	7.84	18
Sep	8	3.65	13	21	3.67	14	18	8.24	32
Oct	2	1.54	5	8	2.34	6	7	4.00	24
Nov	0	0	0	0	0	0	4	3.58	15
Dec	0	0	0	0	0	0	0	0	0

In LIG colony the maximum number of wet containers were plastic containers (32.66%) followed by tin containers (28.62%), earthen pots (19.91%), cement tanks (8.08%), Iron drums (3.73%), discarded tyres (2.49%), and desert coolers (2.18%) respectively. Out of the total positive containers the main containers positive for *Aedes* breeding were earthen pots (51.06%) followed by discarded tyres (12.77%), plastic containers, desert coolers (8.51%), tin containers (6.38%), Iron drums, cement tanks and others (4.26%). Earthen pots were found to be more preferred containers for *Aedes* breeding. Other containers positive for *Aedes* breeding were discarded tyres, desert coolers, iron drums, plastic, tine containers and cement tanks respectively (Table 2).

In MIG colony the maximum numbers of wet containers were tin containers (31.86%), followed by plastic containers (21.24%), cement tanks (14.16%), earthen pots (12.39%), desert coolers (10.91%) and Iron drums (5.31%). Out of the total positive containers the main containers positive were cement tanks (24.24%), followed by desert coolers (21.21%), earthen pots and plastic containers (12.12%). Cement tanks were found to be the more preferred containers for *Aedes* breeding followed by desert coolers, earthen pots/plastic containers. Besides other containers positive for *Aedes* breeding were iron drums, others (9.09%), discarded tyres and tin containers (6.06%) Table 2.

Table 2: Breeding Preference Ratio (BPR) of *Aedes* in different breeding habitats in Dehradun (Uttarakhand).

Types of Breeding Habitats	LIG Colony			MIG Colony			HIG Colony		
	No. of containers with water		BPR (y/x)	No. of containers with water		BPR (y/x)	No. of containers with water		BPR (y/x)
	Exami-ned (x)	+ for *Aedes* larvae (y)		Exami-ned (x)	+ for *Aedes* Larve (y)		Exami-ned (x)	+for *Aedes* larvae (y)	
Earthen pots	128 (19.91)*	24 (51.06)	2.59	84 (12.39)	04 (12.12)	0.98	84 (11.70)	09 (14.75)	1.68
Discarded tyres	16 (2.49)	06 (12.77)	1.71	10 (1.47)	02 (6.06)	0.07	32 (4.46)	12 (19.67)	4.41
Plastic containers	210 (32.66)	04 (8.51)	0.26	144 (21.24)	04 (12.12)	0.57	224 (31.20)	05 (8.20)	0.26
Iron drums	24 (3.73)	02 (4.26)	1.14	36 (5.31)	03 (9.09)	1.71	32 (4.46)	04 (6.56)	1.47
Tin containers	184 (28.62)	03 (6.38)	0.22	216 (31.86)	02 (6.06)	0.19	132 (18.38)	07 (11.48)	0.62
Cement tanks	52 (8.08)	02 (4.26)	0.53	96 (14.16)	08 (24.24)	1.71	64 (8.91)	09 (14.75)	1.66
Desert coolers	14 (2.18)	04 (8.51)	1.95	74 (10.91)	07 (21.21)	1.39	146 (20.33)	15 (24.59)	0.97
Others	15 (2.33)	02 (4.26)	7.30	18 (2.65)	03 (9.09)	5.71	04 (0.56)	-	-
Total	643	47		678	33		718	61	

- Figure in parenthesis indicate percentage

In HIG colony the maximum number of wet containers were plastic containers (31.20%) followed by coolers (20.33%), tin containers (18.38%), earthen pots (11.70%), cement tanks (8.91%), tyres and iron drums (4.46%) respectively. Out of the total positive containers the main containers positive were desert coolers (24.59%) followed by discarded tyres (19.67%), earthen pots and cement tanks (14.75%), tin containers (11.48%), and plastic containers (8.20%). Desert coolers, discarded tyres, earthen pots and cement tanks were found to be more preferred containers for *Aedes* breeding. Similar results were found by Kumar Sarita et al. (2009) at Varanasi city, Uttar Pradesh and Rakesh Katyal and Kumar Sarita (2010) in NCT town Gurgaon, Haryana. In contrary to the present study, in Ranchi (Singh et al., 2008) and Koderma Jharkhand (Singh et al., 2011) major breeding sites of *Aedes* were found in discarded tyres (43.38% and 47.51%) followed by junk materials, cemented tanks, plastic drums/tanks/tubs etc.

In all the localities surveyed the plastic containers were maximum followed by tin containers, earthen pots, Desert coolers and cement tanks. However, coolers were in very less number in LIG colony but out of the total searched, 8.51 % were positive for *Aedes* breeding but In MIG desert coolers were the most preferred breeding container. In HIG colony plastic and tin containers were the primary breeding containers but the desert coolers and discarded tyres were the most preferred breeding containers and contributing maximum for the breeding of *Aedes aegypti* as the breeding from the primary containers.

Just contrast to the finding of present study Kumar et al. (2008) observed that most preferred containers for *Aedes* in Tanakpur (district Champawat) were the cement tanks followed by tyres and tin containers while the result of the present study are similar with the study made by Singh et al., (2010) at Lal Kuwan town of District Nainital, who found among all the habitats, highest positivity of *Aedes* larvae was in earthen pots followed by plastic drums/tanks/tubs, discarded tyres, plastic containers and desert coolers.

Balakrishnan et al. (2006) observed that water containers which were kept indoor were rarely cleaned and remain undisturbed most of the time, thus resulting in high breeding of *Aedes* mosquitoes and water storage habits were found as one of the factors responsible for high *Aedes* breeding.

The disease is closely associated with poor environmental sanitation, inferior housing and inadequate water supplies but in the present study it has been observed that the high income group is contributing more for the breeding of *Aedes aegypti* the vector of dengue and ckikungunya.

There is a need for proper surveillance followed by health education for effectively checking the rise in *Aedes* breeding vis a vis dengue transmission.

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