

# DENGUE

3



## 3.1. Community based dengue vector control under health system in one district (south India) and transfer of technology

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Duration : 3 1/2 years

Funding Agency : WHO/TDR

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Dengue fever (DF) was one of the diseases of public health concern in Southeast Asia but since last two decades there has been a sharp increase in frequency of DF, dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Hence, WHO has categorized dengue as one of the re-emerging diseases with a resolution on 46<sup>th</sup> World Health Assembly that DF, DHF, and DSS should be among the priorities where the disease is endemic. The major priorities were: (i) selective integrated vector control with community and intersectorial participation (ii) active disease surveillance based on a strong health information system (iii) research on vector control. Keeping in view of priorities and suggestions of WHO, baseline studies on dengue and dengue vectors were carried out in Chennai city since April 2001, to understand the epidemiology of dengue with emphasis on entomological and serological aspects. Subsequently, a three year extra mural project on dengue entitled "Community based dengue vector control under health system in one district (south India) and transfer of technology" was started in highly endemic city, Chennai since August 2002 (funded by WHO/TDR).

According to the project proposal after completion of "Preparatory phase", the "Baseline phase" were in January 2004 in which studies on sociological, serological and entomological were conducted before implementing intervention strategies. This was followed by "Intervention phase" (Feb 2004 – Jan 2005), when community based vector control programme (CBVCP) by using information, education and communication (IEC) were carried out in intervention (INT) area only keeping a comparable check (CHK) area. The final phase, "Evaluation phase" (Feb 2005-August 2005) was carried out in which the impact of CBVCP was assessed by standard sociological, entomological and serological parameters.

## POST INTERVENTION PHASE

### Sociological Studies

Based on the KAP survey conducted at pre and post period, in INT areas the community awareness on DF, its cause, mode of transmission and breeding habitats was increased. It clearly shows that the intervention strategies can make impact on community knowledge on dengue (Fig. 13). The KAP survey indicated that the DF awareness level of community in study area increased among different educated groups. Similarly an increase in awareness level on bionomics of vectors i.e., breeding habitat, day biting behaviors etc., was also observed. In qualitative surveys of Focus Group Discussions with women, youths and students it was found that people had acquired knowledge about DF. Key informants had also confirmed the increase of awareness level of community on dengue and emphasized it was due to the introduction of community based IEC programmes. Health personnel expressed (semi-structured interviews) unfamiliarity on DF as diagnostic facilities to detect dengue virus infections were not available in their dispensaries and advocated implementation of effective IEC programme. But in CHK areas, people still misbelieved DF as rat-fever, poison-fever which is supposed to be transmitted by polluted water or by close contact with diseased person. However, the awareness on DF increased moderately from pre to post in CHK areas also. It may be due to the infiltration of IEC by media and local body, as both CHK & INT areas were located in same Chennai city.

Community awareness on management of discarded materials was also increased and the percentage of control practice to avoid vector breeding in these discarded materials considerably increased. However, it indicated that the IEC programme and CBVCP strategies enhanced the knowledge and control practices for the DF vector control and preventions. The continuous intervention will promote positive behavioural changes in community which will lead sustainability in the HHs awareness on mosquitoes breeding in discarded material almost remained same (43% to 41%) in pre and post intervention period in CHK areas for the dengue vector control and prevention.

### Entomological Study

Entomological investigations were made to find out the prevalence, abundance and potential breeding habitats of *Ae. aegypti*, and to identify temporal risk factors related to dengue transmission to priority areas and seasons for vector control. The investigation comprised larval, pupal and adult surveys. For the larval survey, single larva technique [Sheppards *et al.* (1969) *Bull. WHO.* 40, 467] was used, in which a single larva/pupa was collected from individual breeding habitat, which was reared individually upto adult stage in the field-lab to identify upto the species level. Houses were inspected for larval infestations in all the water holding containers (in and around the houses) with the help of flashlight in daytime. *Stegomyia* indices viz., house index (HI), container index (CI) and Breteau index (BI) were calculated [WHO/PAHO, (1994) 548]. In addition, pupal index (PI) was also calculated (WHO / SEARO No.29). The adult collection comprises daytime landing collection of *Aedes* mosquitoes on human bait (after obtaining informed consent) and resting collection of mosquitoes inside the human dwellings. Adults were identified for species, sex and pooled (maximum 20 specimen / pool), which were stored into liquid nitrogen for dengue virus detection / isolation. A sample of wild caught adult females in each survey was also examined for the parity status.

In both INT and CHK areas entomological surveys were made from March to August 2005 and 20,320 water holding containers were examined for the infestation of dengue vector, of these 2.3% were positive in CHK areas. In INT areas 22,874 containers were examined and there was a reduction in the number of positive containers when compared to the CHK areas as only 1.46% of containers were found positive.

There was a general reduction in larval indices in INT areas when compared to CHK areas. In the CHK area, HI was higher in all months when compared to Intervention areas and the mean HI was 14.42 whereas in INT areas HI was 10.88. Breteau Index (BI) was higher CHK area and the values ranged from 12.75 to 27.0 and in INT areas BI ranged from 11.0 to 18.5. The mean BI was 19.46 in intervention areas and 13.88 in Check areas. *Aedes aegypti* breeding in different types of breeding habitats was compared in intervention and CHK areas (Fig. 14). The percentage positivity of *Ae. aegypti* breeding was found higher CHK than INT areas.

In the case of Pupal Index (PI), the habitatwise analysis showed that larger containers (CT/CC, PD, MD) had higher PI than other smaller containers including discarded once. However, the PI value significantly different in INT & CHK areas as the PI ranged from 3.0 to 17.75 in INT and 22.5 to 147.5 in CHK areas. The mean PI value was 10.3 in INT area which was about seven times lower (77.0) than CHK area (Fig. 14). The PI of both the areas was comparable ( $P > 0.05$ ) during pre intervention phase (Base-line phase). It clearly indicate that CBVCP had an effective impact toward the control of vectors with the help of community participation.

There was a difference in resting and landing densities of *Ae. aegypti* between INT and CHK areas (Fig. 14). The per man hour (PMH) density in resting collection ranged between 0.08 and 1.92 (mean = 0.92) in INT area whereas it was between 1.75 and 5.92 (mean = 3.88) in CHK area. Similar trend was observed in human landing collections also and higher landing densities (ranged from 1.58 to 8.33 [mean = 4.96] in CHK areas) and lowered (from 0.25 to 3.08) in INT areas (Fig.14).

During the Intervention Phase, a total of 178 pools of *Ae. aegypti* (1962 specimens) consisting of 59 male pools (846 mosquitoes) and 121 female pools (1116 mosquitoes) collected in landing / resting collections were screened for dengue virus infection in INT area. Three pools (1 male and 2 female) of *Ae. aegypti* mosquitoes were found positive for dengue virus infection which were collected during this period. In CHK areas 4 pools were positive after screening 304 pools (3832 mosquito specimens) indicating both INT & CHK areas having active virus transmission throughout the year in Chennai.

After, the Intervention Phase, a total of 21 pools of *Ae. aegypti* (241 specimens) collected in landing / resting collections were screened for dengue virus infection in INT area. No dengue virus infection was observed, as all the pools were found negative. In CHK area also all the 62 pools consisting of 849 mosquitoes were found negative for dengue virus infection.

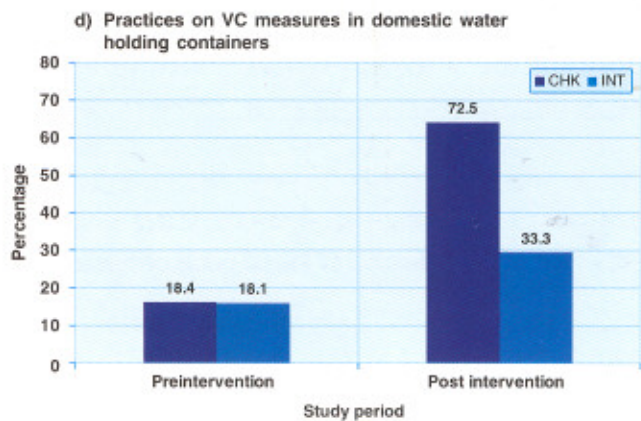
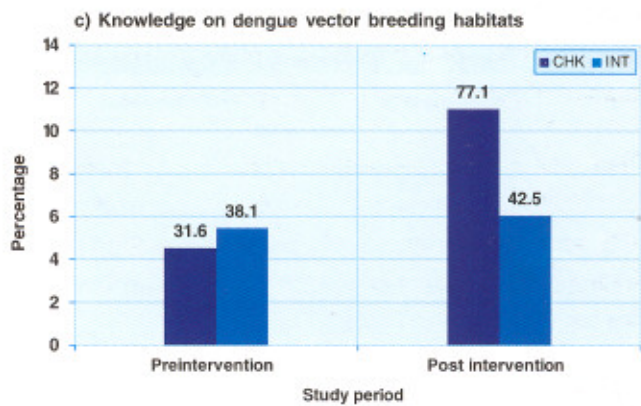
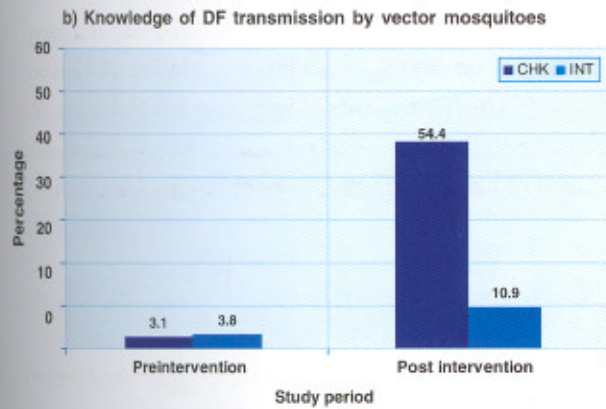
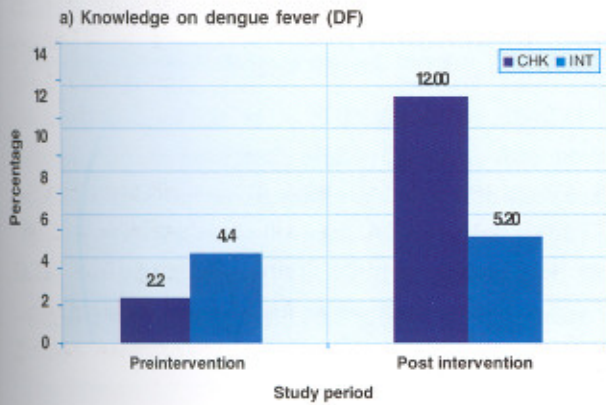


Fig. 13. Impact on IEC campaign during CBVC programme on various aspects of dengue in study area (Chennai).

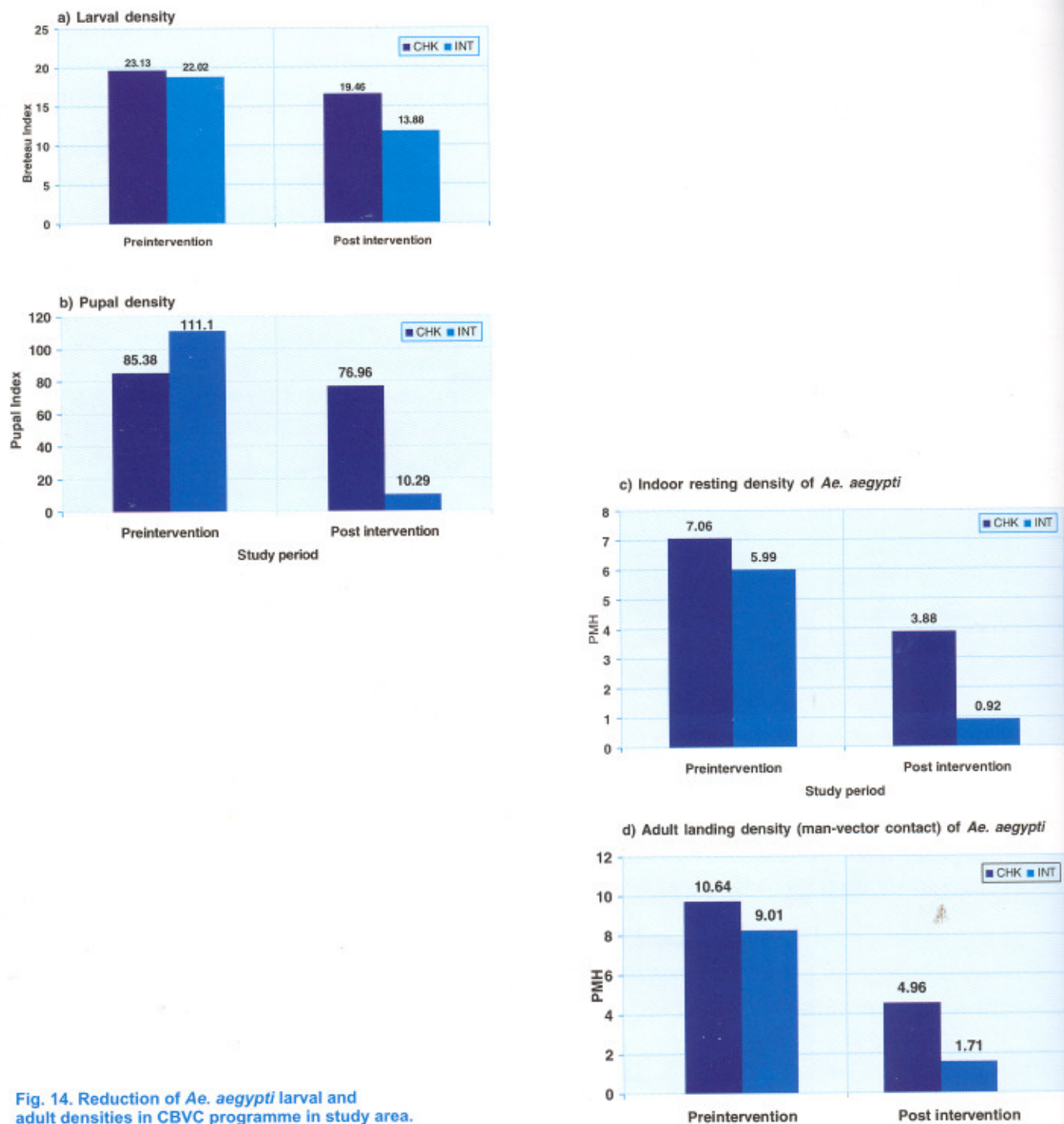


Fig. 14. Reduction of *Ae. aegypti* larval and adult densities in CBVC programme in study area.

## Serological studies

### *Seroprevalence of dengue viruses in school children in Chennai city*

In order to know the status of dengue virus activity in human population a cross-section of school children (6-10years) were examined from study area in Chennai. After obtaining informed consent of their parents, finger prick blood samples were collected in heparinized vials. Plasma samples were examined for Haemagglutination Inhibition (HI) antibody to flavivirus by HI test. In the earlier serological survey of school children during Aug 2003, a total of 1009 blood samples from both INT (506) and CHK (503) were collected. The flavivirus infection in both the areas was comparable as infection rate was found 75.3% and 76.3% (INT & CHK) areas respectively.

The intervention strategies has been implemented since Feb 04 and its impact will be evaluated on dengue case incidence by comparing mono-dengue positive rates during post-intervention phase. Hence, the cohorts of children were followed to determine the seroprevalence and blood samples were again taken during the post-dengue transmission season, in February 2005. A total of 1003 of the children could be followed. Of 1003 samples, 515 and 503 plasma samples were collected from INT and CHK areas respectively. Flavivirus infection rate during post-transmission period was almost same in both the areas and it was 74.9% in CHK area and 72.95% in INT area. However, the prevalence of mono-dengue antibodies in children in INT areas was lower (3.1%) when compared to the CHK areas (5.1%).

### 3.2 Studies on dengue emergence in Kerala State, India.

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Date of commencement & period : March 2002; 3 years

Funding Agency : Intramural

#### Vector infection

Altogether a total of 117 pools [1420 adults of *Aedes* comprising 102 pools of *Ae. albopictus*, 4 *Ae. aegypti* and 11 *Ar. subalbatus*. were collected between April'05 and September'05.. Males [55 pools] and females [62] were screened for the presence of dengue virus by ELISA. Of 117 pools tested, 2 pools of female *Ae. albopictus* collected in June '05 were found positive in ELISA (Table 14). The project concluded with an objectives achieved, with the novelty of discovery of *Aedes albopictus* only transmitting dengue in Kerala.

**Table 14. Details of Aedes mosquito pools screened for dengue virus in Kerala (April '05 - September '05)**

Month & Year	Species	MALE			FEMALE			Total		
		No. of pools +ve	No. of pools tested	Total No. of mosquitoes	No. of pools +ve	No. of pools tested	Total No. of mosquitoes	No. of pools +ve	No. of pools tested	Total No. of mosquitoes
April '05	<i>Ae. albopictus</i>	0	9	170	0	5	51	0	14	221
	<i>Ae. aegypti</i>	0	1	1				0	1	13
	<i>Ar. subalbatus</i>				0	1	13	0	1	13
	<b>Sub total</b>	<b>0</b>	<b>10</b>	<b>171</b>	<b>0</b>	<b>6</b>	<b>64</b>	<b>0</b>	<b>16</b>	<b>235</b>
May	<i>Ae. albopictus</i>	0	3	23	0	3	36	0	6	59
	<i>Ar. subalbatus</i>				0	1	3	0	1	3
	<b>Sub total</b>	<b>0</b>	<b>3</b>	<b>23</b>	<b>0</b>	<b>4</b>	<b>39</b>	<b>0</b>	<b>7</b>	<b>62</b>
June	<i>Ae. albopictus</i>	1	14	237	1	17	279	2	31	516
	<i>Ae. aegypti</i>	0	1	2				0	1	2
	<i>Ar. subalbatus</i>				0	1	6	0	1	6
	<b>Sub total</b>	<b>1</b>	<b>15</b>	<b>239</b>	<b>1</b>	<b>18</b>	<b>285</b>	<b>2</b>	<b>33</b>	<b>524</b>
July	<i>Ae. albopictus</i>	0	7	107	0	6	74	0	13	181
	<i>Ar. subalbatus</i>				0	3	11	0	3	11
	<b>Sub total</b>	<b>0</b>	<b>7</b>	<b>107</b>	<b>0</b>	<b>9</b>	<b>85</b>	<b>0</b>	<b>16</b>	<b>192</b>
Aug	<i>Ae. albopictus</i>	0	4	28	0	5	30	0	9	58
	<i>Ae. aegypti</i>	0	1	1	0	1	1	0	2	2
	<i>Ar. subalbatus</i>				0	2	9	0	2	9
	<b>Sub total</b>	<b>0</b>	<b>5</b>	<b>29</b>	<b>0</b>	<b>8</b>	<b>40</b>	<b>0</b>	<b>13</b>	<b>69</b>
Sep	<i>Ae. albopictus</i>	0	15	168	0	14	148	0	29	316
	<i>Ar. subalbatus</i>				0	3	22	0	3	22
	<b>Sub total</b>	<b>0</b>	<b>15</b>	<b>168</b>	<b>0</b>	<b>17</b>	<b>170</b>	<b>0</b>	<b>32</b>	<b>338</b>
<b>Grand total</b>		<b>1</b>	<b>55</b>	<b>737</b>	<b>1</b>	<b>62</b>	<b>683</b>	<b>2</b>	<b>117</b>	<b>1420</b>