

OUTBREAK INVESTIGATIONS

6



6.1. Japanese encephalitis epidemic investigation in Gorakhpur, Uttar Pradesh

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Period of study : November 2005

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Gorakhpur very recently (2005) faced a devastating epidemic outbreak affecting 6097 individuals with 1398 deaths. In intensity and magnitude, this epidemic surpassed all previous reported epidemic outbreaks. A team from CRME visited Gorakhpur from 13.11.2005 to 26.11.2005 to carry out the epidemiological investigation of Japanese encephalitis epidemic.

Mosquitoes resting on vegetation and bushes around cattle sheds and pigsties were collected after dusk with the help of mouth oral aspirator and transported to the laboratory for identification and enumeration. Entomological investigations were carried out in the following villages situated in the respective districts.

District	Villages
Gorakhpur	Harsewakpur, Semra
Maharajganj	Shymdevurwa, Rampur Chakian-Biraitol
Kushinagar	Titla, Semertmakeshpur
Deoria	Dumree, Dhanavathakala
Sidharthanagar	Khajuriasharai, Shebari
Sant Kabir Nagar	Nandaur, Bardad-Ramawapur



Fig. 19. Japanese encephalitis research activities in Gorakhpur, U.P.

Larval survey was conducted in different habitats like rice field irrigation channel, fallow fields, rice field pools, pond (with water hyacinth), rain water pools, grass lands, cess pools, mud pools and paddy fields.

Dusk collections were also conducted in and around cattle sheds. 14 different species of mosquitoes namely *Culex tritaeniorhynchus*, *Cx. vishnui*, *Cx. pseudovishnui*, *Cx. fuscocephala*, *Cx. gelidus*, *Cx. quinquefasciatus*, *Ma. annulifera*, *Ma.indiana*, *Ma. uniformis*, *An. barbirostris*, *An. hyrcanus (gr)* and *An. peditaeniatus* were collected. *Culex vishnui* subgroups. and *Cx. gelidus*, the primary vectors of Japanese encephalitis, consisted 13% of the total mosquitoes collected. Wild-caught female mosquitoes were tested for JE virus by using antigen capture ELISA and Insect bio-assay. All the mosquito samples tested were negative for JE virus.

We have also conducted serological investigations. Intravenous blood samples were collected from the patients clinically diagnosed as encephalitis and admitted in the district hospital, Gorakhpur. The age distribution of patients ranged from 8 months to 10 years and majority of the patients (65.6%) were female children. All the specimens were refrigerated and transported to our laboratory on ice. The samples were tested for JEV-IgM antibodies by using MAC ELISA kits. All the 32 samples were found negative for JEV-IgM antibodies in both tests. The results were confirmed with MAC ELISA kits obtained from National Institute of Virology, Pune, India.

Gorakhpur has undergone a lot of ecological changes like construction of irrigation canals and dams that enhanced the expansion of rice culture which promoted the breeding of the major and secondary vectors of JE (Kanojia, 2003). The present investigation and from the past records indicate that the environmental factors conducive for the breeding and survival of JE vectors in particular *Cx. tritaeniorhynchus*, and the presence of large number of hosts like pigs may contribute to the persistence JEV in this region.

Detection of JEV IgM antibodies in suspected encephalitis patient sera tested against JEV Chex Elisa Kit & NIV JEV Kit

All the 32 sera samples collected from suspected encephalitis patients during November 2005 were tested for JEV-IgM antibodies by MAC ELISA kits obtained from JEV Chex, X Cyton Diagnostics Ltd., Bangalore and NIV, Pune. All the 32 sera samples were found negative for JEV-IgM antibodies tested by the both kits.

Detection of JE virus antigen in mosquitoes collected from Gorakhpur district during November 2005

A total of 60 pools of mosquitoes [49 pools of *Culex* and 11 pools of *Mansonioides*] collected from Gorakhpur district during November 2005 were screened for JEV by antigen capture ELISA. All the 60 pools were found negative for JEV.

6.2. Dengue outbreak investigation- Tiruppur town, Coimbatore District

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Period : August 2005-Jauary 2006

Funding : Intramural

Based on the request from the Director of Public Health and Preventive Medicine, Chennai Corporation, a team visited the dengue affected areas in Tiruppur city during the fourth week of August 2005 and a follow up study in January 2006 conducted entomological / serological investigations. Tiruppur is the largest market of knitted-wares in the country and nerve center for the various cultural, social and religious activities, contributing to the growth of the city.

Places surveyed

Rayapuram, Samundipuram, Palayakadu, Chellam Nagar

Entomological study

Of the 149 houses inspected in the 4 wards, 92 houses were positive for *Aedes* breeding. The House Index (HI) ranged between 58.0 and 72.0 In Chamundipuram HI value was the minimum (58.0) and it was high in Rayapuram (72.0). Of the 1685 containers examined, 176 containers were positive for *Aedes* larvae/pupae. The Container Index (CI) was high in Rayapuram (17.7) and the minimum in Chellam Nagar (8.96). The overall Stegomyia Indices were 61.74, 10.45 and 118.1 for HI, CI and BI respectively (Table 19).

Table 19. Details of immature survey carried in Tiruppur Municipality

Period	Area surveyed	Stegomyia indices			
		HI	CI	BI	PI
Aug 2005	Rayapuram	72.00	17.70	140.00	328.00
	Chamundipuram	58.00	9.67	94.00	122.00
	Palayakadu	59.50	9.89	124.30	40.50
	Chellam Nagar	62.10	8.96	129.70	127.00
	Total	61.74	10.45	118.10	137.60
Jan 2006	Rayapuram	39.60	7.14	62.30	243.00
	Chamundipuram	36.40	3.67	45.45	63.60
	Palayakadu	13.30	1.35	17.78	11.11
	Chellam Nagar	56.60	10.98	122.60	688.60
	Total	26.90	4.77	38.80	176.22

Breeding of *Aedes aegypti*, the principal vector of dengue was recorded in all the wards surveyed. Breteau index (Number of positive containers per 100 houses) was very high (30-50) in all the wards surveyed. (Table 19).

Table 20 shows that *Aedes* breeding was observed high in Cement tank (42.31%) followed by Cement cistern (31.82%), Plastic drums (26.83%), Metal drum and Plastic containers (5.56%). *Aedes* breeding was also found in metal or plastic containers in less number. Temporary receptacles like discarded containers, plates placed beneath the flowerpots, flower vases and bottles used for nurturing ornamental plants are found with *Aedes aegypti* breeding (Table 20).

Table 20. Details of breeding of Aedes mosquitoes in different habitats in Tiruppur Municipality (August 2005)

Sl No.	Habitat	Rayapuram			Chamundipuram			Palayakadu			Chellam Nagar		
		No. of containers examined	No. of containers positive	%	No. of containers examined	No. of containers positive	%	No. of containers examined	No. of containers positive	%	No. of containers examined	No. of containers positive	%
1	Cement cistern	22	7	31.82	67	25	37.31	56	25	44.64	6	5	83.33
2	Cement tank	26	11	42.31	22	5	22.73	18	4	22.22	10	3	30.00
3	Plastic drum	41	11	26.83	133	10	7.52	135	8	5.93	209	34	16.27
4	Plastic container	36	2	5.56	155	1	0.65	144	3	2.08	196	3	1.53
5	Metal drum	31	1	3.23	52	4	7.69	21	2	9.52	47	3	6.38
6	Metal container	30	0	0.00	55	1	1.82	56	0	0.00	54	0	0.00
7	Discarded container	0	0	0.00	0	0	0.00	2	2	100.00	0	0	0.00
8	Grinding stone	2	1	50.00	2	1	50.00	2	0	0.00	3	0	0.00
9	Mud pot	6	0	0.00	0	0	0.00	23	2	8.70	0	0	0.00
10	Flower pot	1	1	100.00	0	0	0.00	0	0	0.00	0	0	0.00
11	Fridge tray	0	0	0.00	0	0	0.00	2	0	0.00	1	0	0.00
12	Sump	2	0	0.00	0	0	0.00	1	0	0.00	5	0	0.00
13	Sintex	1	1	100.00	0	0	0.00	0	0	0.00	0	0	0.00
14	Tyre	0	0	0.00	0	0	0.00	2	0	0.00	2	0	0.00
15	Tree hole	0	0	0.00	0	0	0.00	2	0	0.00	3	0	0.00
Total		198	35	17.68	486	47	9.67	464	46	9.91	536	48	8.96

The presence of *Aedes* pupae was observed in the following:

Cement tank, Discarded container, Metal drum, Plastic drum, Plastic container

Forty percent of cement tanks were found positive for *Aedes* larvae and 6.5% for *Aedes* pupae. Cement tank was the major contributor for the production of *Aedes* mosquitoes, followed by metal drum. Even though to discarded container contributor for *Aedes* breeding in large numbers the pupal production was found less.

A total of 43 pools of *Aedes aegypti* mosquitoes (Males 37 mosquitoes in 11 pools and females 140 mosquitoes in 32 pools) and 3 pools of *Ae. albopictus* were preserved in LN₂ and transported to Madurai for the detection of dengue virus (Table 21). Of these, 4 pools of *Ae. aegypti* (3 female and 1 male pool) were found positive for dengue viruses using ELISA.

Serological study

Human plasma samples were collected from the patients admitted in Government Hospital, Tirupur and some of the private clinics. However, emphasis was given to collect specimens from paediatric group. Overall 40 sera samples were collected and tested for the presence of IgM antibodies by Pan Bio (Australia) diagnostic kits. The percentage positivity was found to be 55% (22/40) for dengue virus infections.

Follow up studies (January 2006)

Entomological study

Of the 206 houses inspected in the 4 wards, 77 houses were positive for *Aedes* breeding. The House Index (HI) ranged between 13.3 and 56.6. In Palayakadu HI value was the minimum (13.3) and it was high in Chellam Nagar (56.6).

Of the 2320 containers examined, 111 containers were positive for *Aedes* larvae/pupae. The Container Index (CI) was high in Chellam Nagar (10.98) and the minimum in Palayakadu (1.35). The over all *Stegomyia* Indices was 26.9, 4.77 and 38.8 for HI, CI and BI respectively (Table 19).

Table 21. Details of adult indoor density in Tiruppur Municipality

Period	Area surveyed	Man hour	Resting Index (PMH)		Man hour	Landing Index (PMH)	
			<i>Ae. aegypti</i>	<i>Ae. albopictus</i>		<i>Ae. aegypti</i>	<i>Ae. albopictus</i>
Aug 2005	Rayapuram	2.0	19.5	0.0	-	-	-
	Chamundipuram	2.0	6.0	0.0	1.0	8.0	0.0
	Palayakadu	2.0	6.0	0.0	1.0	17.0	0.0
	Chellam Nagar	2.0	4.0	0.0	1.0	6.0	0.0
Jan 2006	Rayapuram	2.0	11.0	0.0	1.0	2.0	0.0
	Chamundipuram	2.0	10.5	0.0	1.0	2.0	0.0
	Palayakadu	2.0	14.0	0.0	1.0	15.0	0.0
	Chellam Nagar	2.0	11.0	0.0	1.0	4.0	0.0

Breeding of *Aedes aegypti*, the principal vector of dengue was recorded in all the wards surveyed. Breteau index (Number of positive containers per 100 houses) was very high in all the wards surveyed.

Table 22 shows that *Aedes* breeding was observed high in Cement tank (25.0%) followed by Plastic drums (10.1%), Cement cistern (7.1%), Metal drum (4.5%) and Metal containers (3.9%). *Aedes* breeding was also found in plastic containers in less number. Temporary receptacles like discarded containers, plates placed beneath the flowerpots, flower vases, bottles used for nurturing ornamental plants, mud pots were found with *Aedes aegypti* breeding.

The presence of *Aedes* pupae was observed in the following:

Cement Tank, Discarded container, Metal drum, Plastic drum, Plastic container

A total of 31 pools of *Aedes aegypti* mosquitoes (Males 55 mosquitoes in 8 pools and females 116 mosquitoes in 23 pools) were preserved in LN₂ and transported to Madurai for the detection of dengue virus and all the pools were found negative for dengue viruses antigens.

Table 22. Details of breeding of *Aedes* mosquitoes in different habitats in Tiruppur Municipality (January 2006)

Sl. No.	Habitat	Rayapuram			Chamundipuram			Palayakadu			Chelam Nagar		
		No. of containers examined	No. of containers positive	%	No. of containers examined	No. of containers positive	%	No. of containers examined	No. of containers positive	%	No. of containers examined	No. of containers positive	%
1	Cement cistern	30	3	10.00	58	2	3.44	86	2	2.33	9	6	66.67
2	Cement tank	17	6	35.30	7	1	14.29	10	0	0.00	10	4	40.00
3	Plastic drum	91	5	5.49	165	12	7.28	193	3	1.55	226	48	21.24
4	Plastic container	163	4	2.45	355	1	0.28	230	0	0.00	302	2	0.66
5	Metal drum	62	3	4.84	39	2	5.13	44	1	2.27	32	2	6.25
6	Metal container	77	2	2.60	30	3	10.00	20	0	0.00	1	0	0.00
7	Discarded container	0	0	0.00	11	2	18.20	0	0	0.00	3	1	33.30
8	Grinding stone	4	3	75.00	2	0	0.00	3	1	33.30	4	1	25.00
9	Mud pot	5	3	60.00	1	1	100.00	3	0	0.00	0	0	0.00
10	Flower pot	6	3	50.00	2	1	50.00	1	0	0.00	1	1	100.00
11	Fridge tray	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
12	Sump	6	0	0.00	11	0	0.00	0	0	0.00	3	0	0.00
13	Sintex	0	0	0.00	4	0	0.00	0	0	0.00	0	0	0.00
14	Tyre	1	1	100.00	3	0	0.00	1	1	100.00	1	0	0.00
15	Tree hole	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
	Total	462	33	7.14	688	25	3.63	591	8	1.35	592	65	10.98

Serological study

Human plasma samples were collected from the patients admitted in Government Hospital, Tirupur and some of the private clinics. However, emphasis was given to collect specimens from paediatric group. Overall 21 sera samples were collected and tested for the presence of IgM antibodies by NIV, Pune MAC-ELISA diagnostic kits. The percentage positivity was found to be 19% (4/21) for dengue virus infections.

Summary

The study showed that there was dengue epidemic in Tiruppur town area and *Ae. aegypti* has played the role as a principal vector. Follow up study showed that both vector density as well as the dengue virus activity was decreased after nearly 5 months of the control measures taken by the state health authorities. The number of positive pools in vector mosquito was 'zero' in the month of January 2006 whereas 3 pools (6.97%) positive during August 2005. Serosurveillance also shows that declining trend as 55% sera was positive in August 2005 decreased to 19% in January 2006.