WEEKLY EPIDEMIOLOGICAL REPORT

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Vector Control in Dengue

Vector control is the mainstay in our current efforts to control dengue transmission. It potentially offers a multi-disease control, including other mosquito borne infections like Chikungunya and Zika. Studies have shown that there are many limitations in the vector control strategies that we apply for control and prevention of dengue, considering the complexity and realities of vector biology, dynamics of geographic expansion and the increasing dengue disease burden seen in our country.

A long standing issue has been that the vector control programmes are largely carried out in a reactive nature. Most of the time, it is an immediate response to a dengue outbreak situation carried out case-by-case or area-wise. These are usually carried out haphazardly in a hurried manner, not scaled up, not sustained, and most importantly not evaluated adequately.

The underlying aim of all vector control programmes is not only to reduce the numbers in the mosquito population, but to reduce the risk of disease transmission to human beings. Unfortunately, some scientific studies have found that there is no clear association between the vector indices and the force of dengue transmission. This also points out that there is a great need for much improved and standardized studies, in order to better understand the ecology of the *Aedes* mosquito and explain its virus transmission dynamics.

Historically, only 3 successful large-scale regional or national level efforts in dengue vector control initiatives are clearly attributed to relative successes. All these efforts highlighted that the community-based programmes consumed substantial resources and eventually were not sustainable.

In the mid-20th century, an *Aedes* eradication programme was conducted by the Pan American Health Organization (PAHO) aiming at continental eradication of *A. aegypti* mosquitoes, with the objective of eradicating yellow fever in the Americas. It was an intensive military-style campaign of aggressive source reduction and spraying of residual insecticide (dichlorodiphenyltrichloroethane, DDT) done from 1947 to 1970. By 1962, *A. aegypti* was eliminated from 18 countries in the Americas. Unfortunately, mosquito reinvasion occurred rapidly afterwards because they developed resistance to insecticides (DDT), and due to non-sustained resources, community and political fatigue, and complacency.

The other two examples of large-scale dengue control successes in the past were in island countries, with effective vector control periods in Singapore (from 1973–89) and in Cuba from 1981–97. The mosquito control efforts in Cuba was intensified as a reaction to its first epidemic of dengue haemorrhagic fever (DHF) cases in 1981 (it was the first time DHF cases were noted in the Americas). Both Singapore and Cuba conducted large-scale and intensive vertical programmes that emphasized on larval control.

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Both efforts eventually failed, in Cuba because of changes in policy and programme funding, and in Singapore because of the low herd immunity and massive importation of dengue from other Asian countries. Since the 1980s, greater emphasis has been placed on community based control programmes but its implementation research has been limited.

Conventional insecticides, which include larvicides such as the organophosphate temefos, and bio-larvicides, particularly *Bacillus thuringiensis israelensis* (Bti), are being used widely. These are used with suggested efficacy reports based on available entomological indices. As the application methods and techniques have not yet been standardized and clinical endpoints on transmission rates are not usually measured, no causal effect has been shown. In addition, there is a major concern about widespread *Aedes* spp resistance being developed to temefos and pyrethroids. Resistance to Bti is not yet a major concern, but it is not recommended to be used as a sole insecticide. Therefore, a future pipeline is needed of novel residual insecticides as well as further research into plant-derived, potentially vector-harmful effective molecules and nanotechnology.

Attention has been driven towards novel techniques of biological, genetic, and behavioural approaches targeting *Aedes* mosquitoes. One promising method is the use of the *Wolbachia* bacteria strains, specifically adapted to infect the *Aedes aegypti* mosquitoes, which reduces mosquito fecundity and lifespan, and blocks the replication of dengue virus. In this method, mosquitoes are infected with *Wolbachia* in the laboratory and these adults or infected eggs are deliberately released, with the aim of transforming and suppressing the *Aedes* populations in the long term, and reducing transmission of dengue and potentially other *Aedes* borne diseases. Field trials and mathematical modelling of the potential effects of *Wolbachia* are encouraging. Trials have been already done in Australia, Colombia, Vietnam, Indonesia, and Brazil. In Brazil, there was great interest in expanding the *Wolbachia* programme because of a large outbreak of Zika virus infections transmitted by the same *Aedes* species mosquito, and linked to an increase in infants born with microcephaly. This method is currently being assessed for a feasibility study and introduction in Sri Lanka as well.

Another strategy is the use of genetically modified mosquitoes known as the RIDL (Release of Insects Carrying a Dominant Lethal) method. Male *Aedes* mosquitoes are genetically modified to carry a lethal gene and then they are released into the wild. After mating with wild-type females, the transgene is passed to embryos, resulting in larval death before they emerge as adults. The aim of this method is to replace or suppress wild populations and reduce the transmission of vector borne diseases. Some drawbacks of this method include the labour-intensive methods needed for replenishment of transgenic males, and the concerns among the public about genetically modified organisms being released into the community. It is necessary that strategies and recommendations are made to ensure that the genetically modified mosquitoes are safe, but this could limit the large-scale use of this method.
Other potential approaches include novel behavioural based tools, which require in-depth understanding of mosquito behaviour, such as mating, swarming, and chemical cues. These could improve and synergize the different methods towards a more effective vector control, meeting the challenges of scale of usage and its sustainability.

There is a clear need for more vector epidemiology and ecological and behaviour-based research. It would be necessary for a better understanding not only of the clinical consequences of novel tools and insecticides, but also of skilled, evidence-based application and monitoring. A major need is to develop standards for vector control methods that are implemented by trained personnel, and to develop integrated vector management programmes that demonstrate cost-effectiveness. Community ownership will be essential for a sustainable vector control programme, and as early experiences have shown, no single vector control approach used in isolation is expected to control *A. aegypti*. Systematic entomological and disease surveillance is essential to measure epidemiological effects on dengue transmission.

Compiled By :

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Table Selected notifiable diseases reported by Medical 25th – 31st May 2019 (22nd

RDHS Division	Dengue Fever		Dysentery		Encephaliti s		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Chickenpox		Meningitis		Leishmania- sis		WRCD	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	T*	C**
Colombo	211	4277	3	24	0	3	1	8	0	26	6	89	0	7	0	5	0	0	10	239	2	27	0	3	**49**	**100**
Gampaha	102	2665	3	13	0	1	0	3	0	15	0	50	0	2	1	3	0	1	4	207	1	12	5	71	**50**	**98**
Kalutara	92	1380	0	36	0	4	1	10	4	35	9	247	0	4	0	4	0	0	16	365	1	57	0	3	**62**	**96**
Kandy	58	1236	4	46	0	7	0	1	0	10	5	37	0	43	0	2	0	1	7	143	2	32	0	17	**64**	**100**
Matale	2	221	0	14	0	3	0	0	0	4	0	29	0	4	0	3	0	1	0	45	0	3	2	115	**56**	**98**
NuwaraEliya	3	81	9	53	0	1	0	4	1	1	4	23	0	37	0	4	0	0	2	45	0	24	0	0	**25**	**100**
Galle	223	1367	0	26	0	4	0	3	0	4	11	176	1	23	0	4	0	0	10	215	0	31	0	2	**61**	**99**
Hambantota	24	501	0	3	0	1	0	0	0	5	2	53	1	71	1	2	0	1	5	192	1	19	22	377	**73**	**100**
Matara	35	689	2	8	0	4	0	1	0	6	15	151	1	19	1	13	0	0	5	153	0	5	5	253	**59**	**100**
Jaffna	9	1906	8	89	0	6	1	15	2	21	0	22	3	258	0	3	0	0	10	150	2	10	0	0	**26**	**93**
Kilinochchi	7	96	0	8	0	1	0	9	0	0	0	17	0	23	0	1	0	0	0	3	0	3	0	7	**49**	**100**
Mannar	1	72	0	2	0	1	0	7	0	1	0	1	0	8	0	0	0	0	0	0	0	0	0	1	**49**	**100**
Vavuniya	4	173	0	6	0	9	0	19	0	3	2	41	0	4	0	0	0	0	0	53	0	8	0	1	**56**	**100**
Mullaitivu	1	99	0	6	0	0	0	5	0	2	2	17	0	6	0	0	0	0	0	2	0	5	0	4	**27**	**99**
Batticaloa	25	833	2	48	0	2	1	11	0	4	2	29	0	1	0	0	0	1	7	145	1	11	0	0	**52**	**100**
Ampara	2	103	5	19	0	2	0	0	2	6	1	22	0	1	1	10	0	0	3	97	1	7	0	4	**57**	**100**
Trincomalee	20	591	0	8	0	0	0	0	6	14	0	6	0	3	0	1	0	0	4	109	0	5	0	1	**37**	**80**
Kurunegala	29	750	2	34	0	7	0	4	0	15	3	99	0	12	1	14	0	0	10	358	3	45	13	402	**58**	**100**
Puttalam	3	253	1	15	0	2	0	1	0	1	0	19	0	8	0	1	0	0	3	94	0	24	1	6	**59**	**100**
Anuradhapura	7	232	2	19	0	5	0	3	1	4	1	84	1	26	0	15	1	2	3	320	2	47	10	261	**41**	**96**
Polonnaruwa	6	127	0	13	0	2	0	1	0	0	5	45	0	3	0	15	0	0	14	199	0	12	6	132	**60**	**100**
Badulla	13	306	2	35	0	4	0	5	0	56	11	97	5	56	0	13	0	0	8	155	7	105	0	10	**66**	**100**
Monaragala	10	215	0	29	0	3	0	0	0	77	5	151	2	60	0	34	0	0	5	156	4	84	0	10	**62**	**100**
Ratnapura	65	959	2	49	0	22	0	6	0	11	27	374	0	19	2	16	0	4	9	215	2	80	1	78	**44**	**99**
Kegalle	30	561	2	23	0	11	1	1	0	22	10	90	0	22	2	77	0	0	13	257	2	20	1	19	**64**	**100**
Kalmune	7	475	0	21	0	0	0	1	0	9	0	20	0	2	0	1	0	0	4	129	0	14	0	0	**63**	**100**
SRILANKA	**989**	**20168**	**47**	**647**	**0**	**105**	**5**	**118**	**16**	**352**	**12**	**1989**	**14**	**722**	**9**	**241**	**1**	**11**	**152**	**4046**	**31**	**690**	**66**	**1777**	**54**	**98**

Source: Weekly Returns of Communicable Diseases (WRCD).

*T=Timeliness refers to returns received on or before 31st May , 2019 Total number of reporting units 353 Number of reporting units data provided for the current week: 333 C**-Completeness

A = Cases reported during the current week. **B** = Cumulative cases for the year.

Table 2: Vaccine-Preventable Diseases & AFP 25th – 31st May 2019 (22nd Week)

Disease	No. of Cases by Province									Number of cases during current week in 2019	Number of cases during same week in 2018	Total num- ber of cases to date in 2019	Total number of cases to date in 2018	Difference between the number of cases to date in 2019 & 2018
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	00	00	00	00	00	00	00	00	00	00	01	35	23	52.1 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	01	01	00	00	01	01	00	01	01	06	09	168	164	2.4 %
Measles	01	06	05	00	00	00	00	00	00	12	02	143	56	155.3 %
Rubella	00	00	00	00	00	00	00	00	00	00	00	00	04	0 %
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Tetanus	00	00	00	00	00	00	00	00	01	01	00	08	11	- 27.2 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Japanese En- cephalitis	00	00	00	00	00	00	00	00	00	00	00	07	15	- 53.3 %
Whooping Cough	01	00	01	00	00	00	00	00	00	02	03	31	24	29.1 %
Tuberculosis	119	45	35	08	00	01	10	05	14	237	329	3612	3571	1.1 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.
RDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna,
KN: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam,
AP: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.
Data Sources:
Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Neonatal Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps., Rubella, CRS,
Special Surveillance: AFP* (Acute Flaccid Paralysis), Japanese Encephalitis
CRS =**Congenital Rubella Syndrome
NA = Not Available

Dengue Prevention and Control Health Messages

Look for plants such as bamboo, bohemia, rampe and banana in your surroundings and maintain them free of water collection.

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Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to **chepid@sltnet.lk. Prior approval should be obtained from the Epidemiology Unit before pub- lishing data in this publication**

ON STATE SERVICE

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