MONTHLY DENGUE UPDATES

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CONTENTS

Use of indoor residual spraying for control of *Aedes* adult mosquitos in Sri Lanka

Dengue is one of the important vector-borne diseases in Sri Lanka. Globally, it has spread over 130 countries affecting nearly 3.9 billion people annually. While dengue has become endemic in Sri Lanka over the last few decades, recurring outbreaks are observed mainly due to environmental, viral and vector related factors.

Integrated Vector Management (IVM) approach described as, "a rational decision-making process for the optimal use of resources for vector control" adopted by World Health Organization since 2007. Vector control measures in dengue target different life cycle stages of the vector. For adult mosquito control, fogging is used to rapidly bring down infected adult mosquito population during outbreaks.

However, new research needs to be carried out systematically to identify novel measures in dengue control.

What is Indoor Residual Spraying (IRS)?

IRS is the application of a long-lasting, residual insecticide to potential resting surfaces of vectors such as walls, eaves and ceilings of houses or structures (including domestic animal shelters), where such vectors might come into contact (Operational manual for indoor residual spraying for malaria transmission control and elimination Second edition 2015).

This method has long been in use for control of malaria, where the vector mosquito rests in the above mentioned sites. Same strategy has been adopted to control *Aedes* mosquito in some countries, reporting 86% - 96% reduction in dengue transmission in the Australian city of Cairns (Vazquez-Prokopec et al., 2010; Vazquez-Prokopec et al., 2017a) and has satisfactorily controlled pyrethroid-resistant vector population (Vazquez-Prokopec et al., 2017b). Likewise, the Latin American countries widely use IRS in controlling adult *Aedes* mosquitoes. Therefore, it is important to perform research in local setting to assess the effectiveness of IRS in Sri Lanka.

Difference between IRS and space spraying

In space spraying, insecticide is converted into particles by compression and released as droplets in to the space. Thus, insecticide droplets which come into contact with the mosquitoes are absorbed by their body surface leading to death, whereas during IRS, the death of mosquito occurs by absorbing the insecticide sprayed on to the resting surfaces of the mosquito within the household.

Use of IRS for *Aedes* control

During space spraying, only the *Aedes* mosquitoes active in the environment during that limited time period are killed. The environmental factors and technical factors leading to different droplet sizes may affect the chemical floating time in the air and thus the period of contact with the vector in the environment.

However during IRS, due to residual effect chemical may stay active for a long period of time (3-6 months) on the surface. Though the viable period may differ according to the chemical used, the relatively long lasting effect gives considerable benefits against repeated use in short term during space spraying.

Other major advantage of IRS is that it does not depend on the weather condition at the time of spraying, thus allowing IRS possible at any time of the day.

Important factors to be considered for implementing IRS for the two dengue vector species, *Aedes aegypti* and *Aedes albopictus*

Vector bionomics

During IRS, important vector bionomics to consider are resting places and the biting pattern of the vectors. The knowledge on common resting places and preferred height of the resting places; the conditions where they are active and bite humans are important in planning IRS. These known norms can be experimented during IRS to generate new knowledge specific to local setting as there is lack of data regarding *Aedes* vectors in Sri Lanka.

Seasonal density and distribution of the vector

The knowledge on geographical vector distribution is important in planning IRS activities to assess effectiveness for the two species separately. The mapping of the distribution of two vector species at PHI/ MOH level would enable to identify areas for IRS for two species separately. However, for those areas, seasonal fluctuations of the vector densities also have to be considered. By carrying out IRS in these settings, we can develop more knowledge on the type of insecticide and the period of effectiveness.

Resting and feeding behavior

In gathering data on adult mosquitos, indoor hand collection via mouth aspiration technique needs to be carried out. By using the mouth aspirator, we can get accurate information about the collected mosquitoes such as resting area, resting surface, resting height and resting species individually and by mosquito species. For unreachable surfaces, mechanical aspirators such as prokopack could be used to assess the above data.

Insecticide susceptibility status

Accurate susceptibility status of the insecticides that are used for IRS is crucial for effectiveness of this approach. Therefore, regular susceptibility testing for insecticides needs to be carried out. Application of residual spraying of insecticide for which the vector has developed resistance, will be unsuccessful and unproductive.

In general, the chemical used in IRS in Sri Lanka for Aedes control is Lambda cyhalothrin. It is recommended to gather more scientifically plausible evidence in different local settings for generalized use.

References

(1) Pan American Health Organization. Manual for Indoor Residual Spraying in Urban Areas for Aedes aegypti Control. Washington, D.C.: PAHO; 2019. http://iris.paho.org

(2) Vazquez-Prokopec, G. M., Kitron, U., Montgomery, B., Horne, P., & Ritchie, S. A. (2010). Quantifying the Spatial Dimension of Dengue Virus Epidemic Spread within a Tropical Urban Environment. PLoS Neglected Tropical Diseases, 4(12), e920. https://doi.org/10.1371/journal.pntd.0000920

(3) Vazquez-Prokopec, G. M., Montgomery, B. L., Horne, P., Clennon, J. A., & Ritchie, S. A. (2017). Combining contact tracing with targeted indoor residual spraying significantly reduces dengue transmission. Science Advances, 3(2). https://doi.org/10.1126/sciadv.1602024

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2. SUMMARY OF ENTOMOLOGICAL AND EPIDEMIOLOGICAL SURVEILLANCE DATA – March 2021

Province	District	Entomological surveillance data (Source - returns of entomology surveys received by NDCU)				Epidemiological surveillance data (Source – Epidemiology Unit)	
		No. of Premises			Main types of containers positive for larvae and Percentage positivity (%)	Month	
		Inspected	Positive premises	Positive %		March	Cumulative
WP	Colombo	1500	149	9.93	Discarded items (37.4), tyres (10.9), temporary removed items (20.4)	280	562
	Colombo MC	270	33	12.2	Tyre (10), temporary removed items (46), non-used cisterns (11)	86	187
	Gampaha	827	100	12.09	temporary removed items (13.5), Discarded items (21.9), covering items (11)	147	392
	Kalutara	2700	241	8.93	temporary removed items (17.5), covering items(13.5), Discarded items(28.3)	108	276
	NIHS	905	99	10.94	temporary removed items (41), water storage barrel(8.9),discarded items(19)		
CP	Kandy	2499	97	3.88	water storage barrel (25.5), Discarded items(12.3), tyres (12.3)	49	178
	Matale	1100	33	3	Cement tanks (32.4), Discarded items(24.3), covering items(13.5)	12	28
	NuwaraEliya				Data not received	6	15
SP	Galle	2600	219	8.42	Discarded items(23.2),other water storage containers(13.8), ornamentals(13.1)	16	68
	Hambantota				Data not received	34	90
	Matara	1811	148	8.17	other water storage containers(20), ornamentals(14.4), Discarded items(22.8)	31	97
NP	Jaffna	1908	75	3.93	Other water storage items(15.1),discarded items(44.5), ornamentals(6.7)	23	85
	Kilinochchi	600	18	3	water storage barrels(15.8), temporary removed items(36.8), Discarded items(15.8)	0	19
	Mannar	1054	64	6.07	Discarded items(30.4),water storage barrel(17.4), non-used cisterns(14.1)	6	13
	Vavuniya	2072	53	2.56	Other water storage containers (35.3), discarded items (14.5), Pet feeding cups(11.3), ornamental (11.3)	8	21
	Mullativu				Data not received	0	3

EP	Batticaloa	2777	113	4.06	temporary removed items (28), other items (27), ornamentals (8)	493	2589
	Ampara				Data not received	5	11
	Trincomalee	1455	48	3.3	Water storage barrels (18.5), other water storage items (22.2),other items(18.5)	29	69
	Kalmunai	968	113	11.67	Discarded items (22.6), other items (24.7), temporary removed items (17.1)	57	150
NWP	Kurunegala	2606	249	9.55	Cement tanks (11.2), refrigerator trays(12.5), Discarded items(24.4)	126	261
	Puttalam	706	36	5.1	Pet feeding cups (23.5), water storage barrel (19.6), temporary removed items (9.8), ornamentals (9.8),tyres (9.8)	37	116
NCP	Anuradhapura	523	49	9.37	temporary removed items(41.3),water storage barrel(12.7),discarded items(11.1)	11	32
	Polonnaruwa	687	48	6.9	Discarded items(39),temporary removed items(10),other water storage containers(13)	10	20
UP	Badulla	332	28	8.43	Cement tanks(20.6), other water storage containers(26.5) ,Discarded items(23.5)	7	22
	Monaragala	2216	202	9.12	water storage barrels(15.5),covering items(9.6), Discarded items(49.9)	13	32
SGP	Rathnapura	1489	141	9.47	Discarded items(48),covering items(15),tyres(10), temporary removed items(10)	65	159
	Kegalle	3219	178	5.53	Discarded items(21.8),ornamentals(16.6), water storage barrel(19)	47	96
Sri Lanka		**36,834**	**2534**	**6.88**	Discarded containers(27),temporary removed items(12), water storage barrel(8), other water storage containers(8)	**1706**	**5591**

Summaries of Adult Surveys

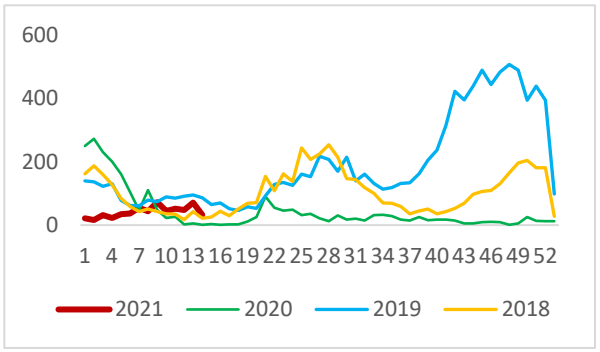
District	MOH	GN area	Findings	
Kalutara (17.03.21)	Bulathsinhala	819H, Gamagewatta	Survey started :8.40am End time:11.50am	No of premises examined: 30 No of posive premises: 07 No of positive mosquitoes: 09 unfed *Aedes albopictus* female mosquitoes

Batticaloa (16.03.21)	Eravur	Locality:Ladies market road	Survey started :8.30am End time:2.45pm	No of premises examined: 20 No of positive premises: 01 No of positive mosquitoes: 02 (blood fed mosquito and semi gravid mosquito)
Badulla (18.03.21)	Hali-Ela	Bogahamadiththa	Survey started :9.35am End time:11.40am	No of premises examined: 10 No of posive premises: 0 No of positive mosquitoes: 0
Resistance monitoring				
District	**Sentinel site**	**Findings**		
Kalmunai	Location: Kalmunai North	Species: *Aedes aegypti* Tested for 0.8% Malathion	Exposure mortality= 89% Control mortality= 00	

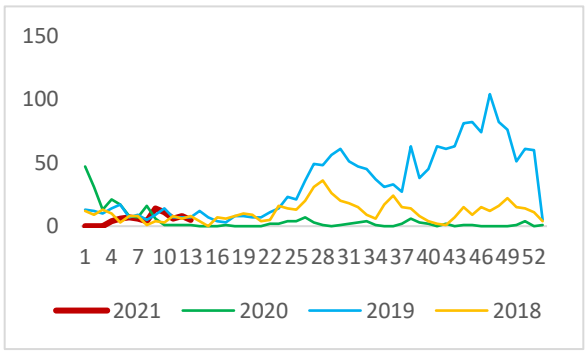
Current high risk MOOH

Epidemiological trends (Source: DenSys data)

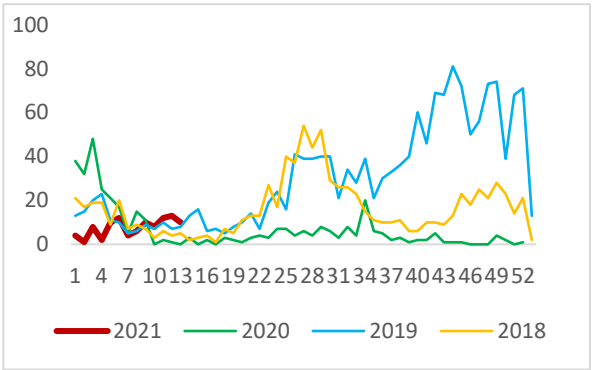
MC Colombo



MOH Wattala



MOH Kelaniya



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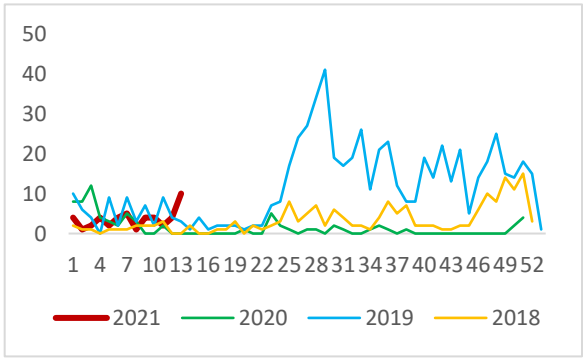

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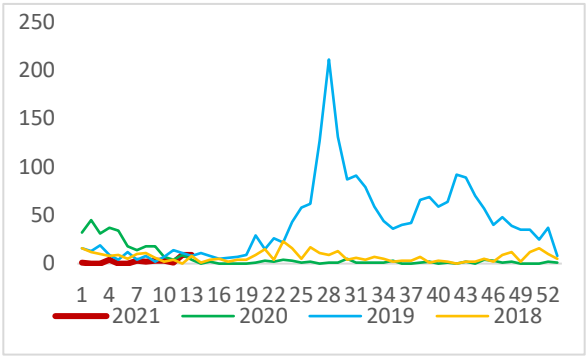
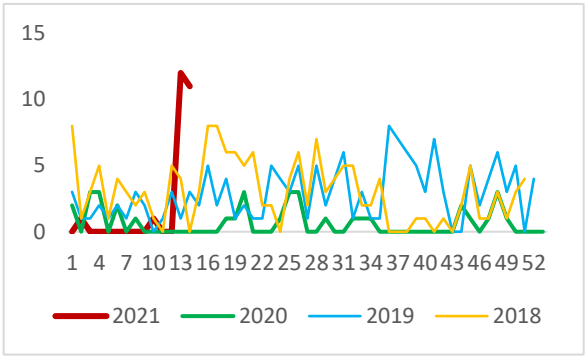


MOH Aranayake



3. DENGUE FORECAST

Entomological forecast of high risk areas		
RDHS	**MOH**	**GN Division**
Rathnapura	Rathnapura PS	Kahangama
Homagama	Homagama	PHI area: Habarakada(Ranala Road)

4. NEWS UPDATES

Special Mosquito Control Campaign: 30th March 2021– 01st April2021

A SMCC conducted in 29 high risk MOH areas in Western province. The health, police and tri-forces participated in the premise inspections.

Release of *Aedes* adult male sterile mosquitos: A project led by university of Kelaniya in collaboration with NDCU, 29.03.2021

Professor Janaki De S. Hewavisenthi, Dean, Faculty of Medicine/ University of Kelaniya, as the chief guest along with the Director/NDCU and the Molecular Biology team at the first release of sterile mosquitoes at Keedarammulla area in Gampaha district.

Technical Support Group meeting: 24.03.2021

Technical Support Group meeting for prevention and control of dengue. The meeting chaired by Director General of Health Services, attended by experts from preventive and curative sectors.

Knowledge sharing sessions: 19th February 2021

This month's speakers were;

Dr. Suraj Perera (CCP- National Cancer Control programme)

Dr. Indika Weerasinghe (Medical Officer- NDCU)

Ms. Thilini Wickramatunga (Molecular Biologist-World Mosquito Programme)

5. Cage bio assay – 04.04.2021

Cage mosquito bio assay for *Aedes aegypti* and *Aedes albopictus*, carried out by the entomology team of NDCU on 04.04.2021

NDCU warmly welcomes articles for **FEATURING ARTICLE** section and news updates on dengue related events for **NEWS UPDATES** column of this report.

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Comments and contributions for publication in the DUR Sri Lanka are welcome.

Prior approval should be obtained from the NDCU before publishing data in this publication.

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