WEEKLY EPIDEMIOLOGICAL REPORT

A publication of the Epidemiology Unit
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WER SRI LANKA 2023

Vol. 50 No. 28 — 08th– 14th July 2023

Dengue infection – Changes in Epidemiology

Introduction

Dengue remains a significant public health challenge worldwide. It is the most rapidly emerging mosquito-borne viral infection in the world resulting in approximately 390 million infections, and approximately 20,000 deaths annually. World Health Organization named dengue as one of the 10 threats to global health in 2019 due to the burden of infection in low- and middle-income countries, and, also, as there has been a 15-fold increase in dengue over the last 2 decades.

Changing factors for the dengue disease epidemiology

Changes in the dengue virus (DENV) serotypes, population, immunity and other socio-ecological factors such as changes in land use, urban poverty and human movement have been shown to play an important role in the incidence of dengue.

Over time, the epidemiology of dengue infection has undergone several changes. Here are some key aspects of the changing epidemiology of dengue:

Geographic Expansion

Dengue fever was historically prevalent in tropical and subtropical regions, but in recent decades, its geographic range has expanded significantly. The disease has spread to new areas, including temperate regions, due to factors such as urbanization, globalization, and climate change. Outbreaks and sporadic cases have been reported in regions like Europe and the United States, where dengue was previously uncommon or absent.

Increased Disease Burden

The global burden of dengue has increased substantially. The number of reported cases has risen dramatically over the past few decades, with more frequent and larger outbreaks occurring in various parts of the world. This increase in disease burden can be attributed to factors such as population growth, rapid urbanization, inadequate vector control measures, and increased travel and trade, which facilitate the spread of the virus.

The emergence of Severe Dengue

Dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), collectively known as severe dengue, have become increasingly recognized and reported. Severe dengue is characterized by severe bleeding, organ failure, and shock. The factors contributing to the emergence and spread of severe dengue are complex and can include viral factors, host factors, and immunological interactions.

Changing Serotype Dynamics

The relative prevalence of different dengue virus serotypes has fluctuated over time. In some regions, specific serotypes have dominated during certain periods, while others have become more prevalent later on. These shifts in serotype dynamics can influence the severity of outbreaks and the risk of severe dengue, as subsequent infections with different serotypes increase

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the likelihood of severe disease.

A shift in the dominant serotype can lead to increased dengue transmission and outbreaks. This is because individuals who were previously infected with a different serotype may be susceptible to the new serotype, and the population as a whole may have lower immunity to the new serotype

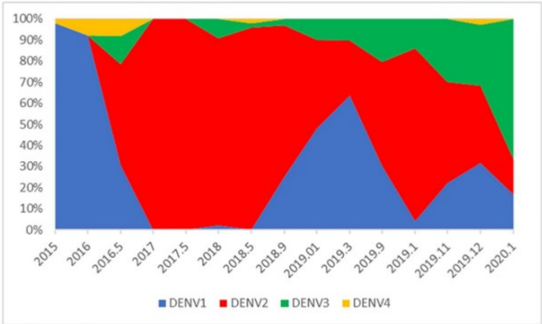

Figure 1: Changes in the circulating DENV serotypes in Colombo, Sri Lanka from 2015 to January 2020.

Malavige, G. N. et al (2021) explained the unique epidemic seen in Sri Lanka during 2017 and the increase in the number of cases seen toward the latter months of 2019 coincides with the introduction of DENV-2 and DENV-3, respectively using the above graph.

There is scientific evidence supporting the idea that shifts in dengue virus serotypes can contribute to outbreaks. A study published in PLOS Neglected Tropical Diseases in 2013 examined dengue outbreaks in Puerto Rico from 1990 to 2010. The researchers found that outbreaks were associated with the introduction of new dengue serotypes, particularly when a shift occurred from serotype 1 to serotype 2 or 3. Another study published in 2015 investigated dengue outbreaks in Thailand from 2001 to 2014. The researchers found that the introduction and spread of a new dengue serotype (DENV-3) were associated with increased transmission and more severe dengue cases.

In 2019, a study examined dengue outbreaks in Malaysia from 2005 to 2016. The researchers observed that outbreaks were linked to shifts in serotypes, with the emergence of DENV-2 and DENV-3 contributing to increased dengue activity. Cummings et al. (2009) investigated the transmission dynamics of dengue serotype 2 in Thailand over 16 years. It highlighted the impact of serotype shifting on the occurrence of large-scale epidemics and the changing patterns of disease severity.

Thai et al. (2010) - "Dengue infection and disease: epidemiology, risk factors, and preventive measures." This comprehensive review article examined the global epidemiology of dengue and discussed the impact of serotype shifting on the occurrence of severe dengue cases and outbreaks. Vu et al. (2010) explored the epidemiology of dengue in Vietnam and discussed the role of serotype shifting in the occurrence of dengue outbreaks. It emphasized the need for comprehensive surveillance and prevention strategies to address the changing dynamics of dengue transmission. Endy et al. (2011) followed a cohort of school children and examined the circulation patterns of dengue serotypes. It observed that serotype shifting led to changes in the spatial distribution and intensity of dengue transmission.

Urbanization and Aedes Mosquitoes

The urbanization of many regions has created favourable environments for the Aedes mosquitoes, particularly Aedes aegypti, which are the primary vectors for dengue transmission. These mosquitoes thrive in urban settings, where they breed in stagnant water containers found in and around human dwellings. The increased urbanization has contributed to the persistence and transmission of dengue in densely populated areas.

Co-circulation of Arboviruses

Dengue now coexists with other arboviruses, such as chikungunya and Zika viruses, in many regions. These viruses share the same Aedes mosquito vectors and can cause similar clinical symptoms, leading to challenges in diagnosis and surveillance. Co-circulation of multiple arboviruses can also increase the overall disease burden and complicate public health responses.

Understanding the changing epidemiology of dengue is crucial for developing effective prevention and control strategies. Enhanced surveillance, improved vector control measures, public awareness campaigns, and the development of vaccines are important components of efforts to mitigate the impact of dengue infection worldwide.

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Table 1: Selected notifiable diseases reported by Medical Officers of Health 01st- 07th July 2023 (27th Week)

RDHS	Dengue Fever		Dysentery		Encephalit		Enteric Fever		Food Poi-		Leptospirosis		Typhus		Viral		Human		Chickenpox		Meningitis		Leishmania-		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	360	9387	0	7	0	10	0	1	0	7	14	190	0	0	0	3	0	0	5	169	2	27	0	5	27	100
Gampaha	314	9800	3	11	0	13	1	3	1	3	18	336	0	7	2	11	0	0	5	158	4	45	0	29	3	100
Kalutara	99	3184	0	14	0	1	0	0	0	5	21	506	0	1	0	4	0	1	8	263	5	57	0	1	19	100
Kandy	285	3676	1	25	0	0	0	7	0	12	12	163	2	39	0	3	0	1	6	156	2	18	2	20	86	100
Matale	26	876	0	2	0	0	0	1	0	8	3	110	1	11	0	3	0	0	0	31	0	4	8	184	22	100
NuwaraEliya	11	147	3	83	0	2	1	3	2	40	9	72	5	48	0	4	0	0	12	81	0	8	0	1	59	100
Galle	73	1489	2	32	0	12	0	5	2	21	18	558	1	29	0	1	0	1	7	204	2	14	0	2	35	100
Hambantota	52	1040	0	6	0	3	0	1	0	8	3	202	1	51	1	8	0	0	2	94	0	16	9	356	25	100
Matara	69	1121	0	19	0	6	0	1	1	12	16	370	0	20	1	3	0	2	5	165	1	15	5	110	53	100
Jaffna	27	1661	1	52	1	2	0	9	0	16	0	8	3	476	0	2	0	1	0	114	0	6	0	2	64	93
Kilinochchi	3	76	2	7	0	0	0	0	0	16	0	7	0	6	0	0	0	0	0	12	0	0	0	0	19	100
Mannar	0	73	0	6	0	0	0	1	0	0	0	30	0	5	0	0	0	0	0	1	0	7	0	0	36	100
Vavuniya	0	115	0	5	0	1	0	0	0	0	0	25	1	8	0	1	0	0	5	19	0	3	1	8	10	100
Mullaitivu	2	93	0	9	0	0	0	3	1	12	0	29	0	5	0	1	0	0	0	12	0	0	0	5	22	100
Batticaloa	62	1917	0	135	0	6	0	5	1	18	1	64	0	1	0	5	0	1	1	46	0	24	0	1	56	100
Ampara	2	71	0	1	0	1	0	0	0	0	2	22	0	0	0	1	0	0	0	20	0	12	0	2	12	50
Trincomalee	23	1884	2	14	0	1	0	0	47	64	0	55	1	14	0	0	0	0	2	36	0	20	0	1	24	100
Kurunegala	86	2114	1	26	0	7	0	0	2	6	5	234	0	9	0	9	0	2	11	298	4	98	11	285	23	100
Puttalam	35	2636	0	8	0	1	0	1	0	1	2	36	0	7	0	1	0	0	3	77	2	35	1	16	21	99
Anuradhapur	23	561	1	6	0	0	0	1	0	2	6	218	0	28	0	2	0	0	3	147	0	30	12	318	23	98
Polonnaruwa	13	444	0	10	0	5	0	0	0	6	3	129	0	5	0	12	0	0	3	52	0	13	14	253	34	98
Badulla	32	700	4	26	2	5	0	0	0	27	15	211	1	30	3	64	0	0	3	107	3	30	3	23	63	100
Monaragala	18	394	0	15	0	5	0	0	0	0	2	396	1	30	0	17	1	1	2	50	0	45	2	104	25	100
Ratnapura	69	1448	1	29	0	13	0	2	1	14	42	735	0	18	0	12	1	2	2	107	1	109	4	110	34	100
Kegalle	105	1977	1	14	1	2	0	2	0	8	31	432	0	22	0	3	0	0	6	256	4	39	5	23	29	100
Kalmune	17	1535	0	44	0	10	0	0	0	0	1	35	0	1	0	0	0	0	0	44	0	22	0	0	40	99
SRILANKA	1806	48419	22	606	4	106	2	46	58	306	22	5173	17	871	7	170	2	12	91	2719	30	697	77	1859	36	98

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). T=Timeliness refers to returns received on or before 07th July, 2023 Total number of reporting units 358 Number of reporting units data provided for the current week: 336 C**-Completeness
A = Cases reported during the current week. B = Cumulative cases for the year.

Table 2: Vaccine-Preventable Diseases & AFP

01st– 07th July 2023(27th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2023	Number of cases during same week in 2022	Total number of cases to date in 2023	Total number of cases to date in 2022	Difference between the number of cases to date in 2023 & 2022
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	00	00	01	00	00	00	00	00	00	01	00	49	43	4.6 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	00	00	00	00	00	00	01	00	00	01	01	113	35	220 %
Measles	02	01	01	00	00	00	00	01	00	05	01	45	13	207.6 %
Rubella	00	00	00	00	00	00	00	00	00	00	00	01	00	0 %
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Tetanus	00	01	00	00	00	00	00	00	00	01	00	06	05	0 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Japanese Encephalitis	00	00	00	00	00	00	00	00	00	00	00	02	07	- 71.4 %
Whooping Cough	01	00	00	00	00	00	00	00	00	01	00	05	01	300 %
Tuberculosis	81	08	10	00	05	28	14	07	12	165	00	4789	3050	51.6 %

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

Take prophylaxis medications for leptospirosis during the paddy cultivation and harvesting seasons.

It is provided free by the MOH office / Public Health Inspectors.

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