WEEKLY EPIDEMIOLOGICAL REPORT

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Ministry of Healthcare and Nutrition

231, de Saram Place, Colombo 01000, Sri Lanka
Tele: + 94 11 2695112, Fax: +94 11 2696583, E mail: epidunit@sltnet.lk
Epidemiologist: +94 11 2681548, E mail: chepid@sltnet.lk
Web: http://www.epid.gov.lk

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Dengue : the changing scenario of the severity of the disease

Introduction

Dengue, a common mosquito-borne infection that is found in tropical and sub-tropical regions around the world, in recent decades has emerged as a major international public health concern posing a risk to about two fifths of the world's population.

Even though the disease usually is a severe flu-like illness, sometimes it can cause a potentially lethal complication called dengue hemorrhagic fever (DHF) which is a leading cause of serious illness and death among children in some Asian countries.

There are four distinct, but closely related, virus subtypes that cause dengue. Recovery from infection by one serotype provides lifelong immunity against that virus but confers only partial and transient protection against subsequent infections caused by other three virus subtypes. Sequential infections emanating from other subtypes increase the risk of developing DHF.

Clinical features

The clinical features of dengue fever vary according to the age of the patient. Infants and young children may have a fever with rash. Older children and adults may have either a mild fever or the classical incapacitating disease with abrupt onset and high fever, severe headache, pain behind the eyes, muscle and joint pains, and rash.

DHF is a potentially deadly complication that is characterized by high fever, often with enlargement of the liver, and in severe cases circulatory failure. The illness often begins with a sudden rise in temperature accompanied by facial flush and other flu-like symptoms. The fever usually continues for two to seven days and can be as high as 41°C, possibly with convulsions and other complications.

In moderate DHF cases, all signs and symptoms abate after the fever subsides. In severe cases, the patient's condition may suddenly deteriorate after a few days of fever; the temperature drops, followed by signs of circulatory failure, and the patient may rapidly go into a critical state of shock and die within 12 to 24 hours, or quickly recover following appropriate medical treatment.

Situation of dengue in Sri Lanka in the past

Before 1989, dengue epidemiology in Sri Lanka was characterized by frequent transmission of all four dengue serotypes with a low incidence of dengue hemorrhagic fever (DHF). However, after 1989 the pattern of dengue in Sri Lanka changed dramatically with an increase in incidence of DHF. Subsequently, the pattern of the severity of the disease was changed. Regular epidemics of DHF has since been reported.

From 1989 to 2002 DENV-2 was the main circulating dengue virus serotype in Sri Lanka, closely followed by DENV-3. However, during the 2004 epidemic, the DENV-3 was found to be the predominant serotype and although the exact reasons for this severe epidemic have not been defined, a change in the predominant circulating dengue viral serotype may have played a role in observed severity. The emergence of DHF in Sri Lanka in 1989 was found to be correlated with the appearance of a new DENV-3, subtype iii variant due to a mutation of the viral genome.

However according to the studies carried out during the outbreak periods, it was found that there was no relationship in platelet count and bleeding manifestations in children in contrast to the findings of platelet count < $50x10^3$/L and packed cell volume >50 among the adults which was closely related to the presence of bleeding manifestations.

In 2005, Central province of Sri Lanka experienced an out break of myocarditis due to dengue virus in which 62.5% of those who were serologically confirmed were reported to be having a cardiac involvement. None of these patients had DHF. There was a clustering of cases among hospital workers and medical students. During the past few years, the characteristics of dengue in Sri Lanka appeared to have changed. For instance, a decade ago, children were predominantly affected, but in recent years clinicians have seen increasing numbers of adult dengue patients with significant morbidity and mortality. Similar trends have also been reported from South Asian, South East Asian and South American countries.

Epidemiology of deaths attributable to dengue

Increasingly large numbers of dengue cases

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have been reported by the clinicians since the beginning of the year 2009. By June 01st, there were 4400 cases detected with 90 deaths giving rise to a case fatality ratio of 1.4. This shows a dramatic increase in the case fatality compared with that of the previous years suggesting the severity of dengue . As an absolute number, Gampaha and Kandy districts have accounted for the highest number of reported deaths (16 and 17 respectively).

As far as the affected age groups were concerned, the highest number of affected people had been adults above 25 years of age followed by those in the 5-15 years age group. Dengue haemorrhagic fever was responsible for the majority of reported deaths while a significant proportion of deaths was due to dengue shock syndrome. Deaths due to other complications were remarkably less. These findings differ with those in 2008 as in the previous year, most of the deaths were due to dengue shock syndrome.

A notable feature in the course of the disease in 2009 was it was fairly rapid leading to deaths unexpectedly early in the course of the disease. This was not apparent during past years. However, Now it transpired that more than half of the deaths occurred in less than 72 hours of the onset of the disease implying its severity. This reflects that there is a very short critical period of time available for the clinicians to save the patients precious life.

Even though about a half of the suspected cases were not confirmed by further investigations, some attempts have been made to come to a definitive diagnosis of a significant proportion of clinically suspected cases. The presence of dengue antibodies namely IgM and IgG and PCR studies were used for the purpose of confirmation of suspected cases.

Available control and preventive options

The prevailing climate condition, environmental pollution, rapid urbanization, overcrowding of cities and careless human practices are providing conducive environment for the rapid breeding of the mosquito vector and the spread of this infection. The ministry of health has launched preventive programmes while recently, clinicians and researchers have been studying different aspects of the disease.

Public health measures play a very important role since the prevention can only be achieved through proper awareness of the disease among public and environmental sanitation. At present, the only method of controlling the spread of transmission of the dengue virus is to combat the vector mosquitoes. In Asian countries, *Aedes aegypti* breeds primarily in man-made containers like earthenware jars, metal drums and concrete cisterns used for domestic water storage, as well as discarded plastic food containers, used automobile tyres and other items that collect rainwater.

Vector control is implemented using environmental management and chemical methods. Proper solid waste disposal and improved water storage practices, including covering containers to prevent access of egg-laying female mosquitoes are among methods that are encouraged through community-based programmes.

The application of appropriate insecticides to larval habitats, particularly those that are useful in households, e.g. water storage vessels, prevents mosquito breeding for several weeks but must be re-applied periodically. Small, mosquito-eating fish and copepods (tiny crustaceans) have also been used with some success in some countries.

During outbreaks, emergency vector control measures can also include broad application of insecticides as space sprays using portable or truck-mounted machines or even aircrafts. However, the mosquito-killing effect is transient, variable in its effectiveness because the aerosol droplets may not penetrate indoors to microhabitats where adult mosquitoes are sequestered, and the procedure is costly and operationally difficult for countries like Sri Lanka. Regular monitoring of the vectors' susceptibility to widely used insecticides is necessary to ensure appropriate choice of chemicals. Active monitoring and surveillance of the natural mosquito population should accompany control efforts to determine effectiveness of the programme.

To reduce morbidity and mortality in this outbreak following strategies have been suggested to be carried out by the health sector in Sri Lanka.

- Proper case management at 'every level'
- Strengthening notification on suspicion
- Improving disease surveillance and outbreak investigation
- Health education

Since the disease is now spreading in to novel areas and some suburban and rural areas are reporting their first cases, primary care doctors should be vigilant on this issue and screening of possible cases and proper management should be strengthened. There are some evidences that more DHF cases are being reported at present day than in the past. This implies that the detection of these cases early in its course is very essential. To effectively address this issue, two approaches should be implemented; patients should be well educated regarding detection of complications early and should not be allowed to take decisions on their own in a case of acute febrile illness; secondly, primary care physicians should also actively look for impending signs and symptoms of serious disease.

Periodic death reviews are being conducted in order to identify and rectify deficiencies and implement effective plans to overcome these in the future. These will help preventing deaths due to DF/DHF and improve subsequent case management. Further, evidence is mounting that unlike in the past, currently more than one serotype is circulating in the population. This makes the number of patients affected very large and the disease course more severe.

Sixty percent of deaths have occurred in patients aged 25-45 years while 30% of the deaths were in the age group of 5 to 15 years. Out of the total deaths that have occurred, 60% were females. That makes more emphasis on households and schools as the main targeted theatres to implement preventive measures.

Sadly, a significant proportion of those who have died has had a prior contact with health personnel either at an OPD of government hospitals, private hospitals r or GP level. Therefore, this underlines the need to use a checklist of possible symptoms at the first contact level especially in endemic areas. These checklists have to be given to the patients after being completed by the doctor and should be available to the primary care doctor to be reviewed if the patient comes back for the same episode of illness. That will allow even another doctor to have some information regarding the initial symptoms and signs. To ease the management of the disease for medical practitioners, a poster has been developed by the Epidemiology Unit in collaboration with the collage of paediatricians and physicians to be displayed at first contact level. Epidemiology Unit has identified the far reaching significance of periodic death reviews with a view to identifying modifiable interventions that would enable reducing the mortality due to dengue. A fruitful discussion has already been held with prominent clinicians in this regard. It has been the consensual opinion that a critical death review with input from clinicians will invariably help improve management strategies directed at preventing dengue deaths. Inputs of colleges of medical professionals will prove to be handy and it will be a tremendous boost to improve the quality of patient management at a wide range of levels from primary helath care to highly specialised care. The next evolutionary step in dengue control and prevention will hopefully focus on this aspect. Need for sharing expert's' experience on ways of patient management is another aspect that needs intensified focus on bringing down dengue specific mortality. It will save hundreds of precious lives which are lost annually due to this disease.

Editor wishes to thank Dr. Hasitha Tissera for his guidance on preparing this article.

The article was prepared by Dr. Upekha Seneviratne

Table 1: Vaccine-preventable Diseases & AFP

13th – 19th June 2009 (25th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2009	Number of cases during same week in 2008	Total number of cases to date in 2009	Total number of cases to date in 2008	Difference between the number of cases to date in 2009 & 2008
	W	C	S	N	E	NW	NC	U	Sab					
Acute Flaccid Paralysis	00	00	00	00	00	00	00	00	00	00	02	39	49	-10.0%
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	-
Measles	00	00	00	00	00	00	01 PO=1	00	00	01	01	64	60	+06.7%
Tetanus	01	00	00	00	00	00	00	00	00	01	01	14	19	-26.3%
Whooping Cough	00	00	00	00	00	00	00	00	00	00	01	30	20	+50.0%
Tuberculosis	12	66	09	01	04	01	05	04	02	222	231	4743	4080	+16.5%

Table 2: Newly Introduced Notifiable Disease

13th – 19th June 2009 (25th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2009	Number of cases during same week in 2008	Total number of cases to date in 2009	Total number of cases to date in 2008	Difference between the number of cases to date in 2009 & 2008
	W	C	S	N	E	NW	NC	U	Sab					
Chickenpox	26	14	10	183	04	07	05	11	13	273	67	10028	2839	+253.2%
Meningitis	03 CB=1 KL=2	03 KD=3	01 MT=1	01 VA=1	02 KM=2	00	00	01 MO=1	05 KG=4 RP=1	16	16	509	751	-32.2%
Mumps	02	03	02	02	01	00	02	13	01	26	40	939	1265	-25.7%
Leishmaniasis	00	00	04 MT=4	00	00	00	01 AP=1	00	00	05	Not available*	435	Not available*	-

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.

DPDHS 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, Whooping Cough, Chickenpox, Meningitis, Mumps.

Special Surveillance: Acute Flaccid Paralysis.

Leishmaniasis is notifiable only after the General Circular No: 02/102/2008 issued on 23 September 2008.

Table 3: Laboratory Surveillance of Dengue Fever

13th – 19th June 2009 (25th Week)

Samples	Number tested	Number positive	Serotypes *				
			D1	D2	D3	D4	Negative
Number for current week							
Total number to date in 2009							

Sources: Genetic Laboratory, Asiri Surgical Hospital

* Not all positives are subjected to serotyping.

NA= Not Available.

Table 4: Selected notifiable diseases reported by Medical Officers of Health

13th – 19th June 2009 (25th Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptospirosis		Typhus Fever		Viral Hepatitis		Human Rabies		Returns Received Timely**
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	166	1742	2	96	1	7	6	95	0	38	7	290	0	4	2	42	0	4	**85**
Gampaha	142	1514	5	85	2	16	1	26	0	9	3	154	0	7	1	43	0	2	**73**
Kalutara	41	533	4	149	2	7	1	36	0	11	3	122	0	1	0	13	0	2	**83**
Kandy	111	1765	3	176	1	5	0	16	0	53	5	130	10	98	2	31	0	0	**74**
Matale	130	590	3	55	0	2	1	22	1	6	8	229	0	3	2	8	0	2	**100**
Nuwara Eliya	24	97	9	255	1	1	11	128	742	770	3	25	3	38	4	37	0	3	**100**
Galle	49	184	6	102	0	9	0	1	0	20	2	92	0	4	1	7	0	0	**89**
Hambantota	37	497	3	50	0	6	0	5	0	5	1	49	1	44	2	14	0	1	**91**
Matara	64	555	7	160	0	3	0	4	0	15	3	90	2	74	1	14	0	2	**94**
Jaffna	0	9	0	68	0	3	0	133	0	27	0	0	1	119	0	66	0	0	**25**
Kilinochchi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Mannar	0	4	0	35	0	1	7	76	0	4	0	0	0	0	1	33	0	0	**75**
Vavuniya	3	10	267	1215	0	2	52	85	0	2	0	2	0	1	516	2426	0	0	**75**
Mullaitivu	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**0**
Batticaloa	19	354	2	159	1	11	0	7	0	41	0	7	0	1	0	6	0	1	**64**
Ampara	14	97	1	30	0	0	0	5	0	5	0	8	0	0	0	6	0	0	**71**
Trincomalee	19	252	4	56	0	2	0	3	0	0	0	14	2	12	0	7	0	1	**80**
Kurunegala	228	1170	5	98	0	8	5	39	0	5	2	54	2	51	3	39	0	4	**84**
Puttalam	41	219	2	77	0	7	1	56	0	0	0	43	0	26	0	6	0	1	**78**
Anuradhapura	40	319	3	64	1	4	1	4	0	2	1	74	0	26	2	23	0	1	**74**
Polonnaruwa	5	57	0	19	0	2	1	14	0	6	1	41	0	0	2	12	0	0	**43**
Badulla	36	130	11	141	0	2	2	26	0	18	3	49	7	58	15	194	0	1	**100**
Monaragala	10	59	1	32	0	0	0	15	0	7	0	11	2	42	4	33	0	0	**100**
Ratnapura	112	702	5	310	0	15	0	34	0	5	4	87	0	22	5	37	0	1	**50**
Kegalle	250	1768	7	86	0	4	0	20	0	6	5	99	2	17	8	95	0	2	**64**
Kalmunai	4	117	1	64	0	1	1	8	0	1	0	9	0	2	0	10	0	0	**77**
SRI LANKA	1545	12744	351	3584	09	118	90	859	743	1056	51	1672	32	650	571	3202	0	28	**76**

Source: Weekly Returns of Communicable Diseases (WRCD).
*Dengue Fever / DHF refers to Dengue Fever / Dengue Haemorrhagic Fever.
**Timely refers to returns received on or before 19th June, 2009 Total number of reporting units =311. Number of reporting units data provided for the current week: 237
A = Cases reported during the current week. B = Cumulative cases for the year.

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ON STATE SERVICE

Dr. P. PALIHAWADANA
CHIEF EPIDEMIOLOGIST
EPIDEMIOLOGY UNIT
231, DE SARAM PLACE
COLOMBO 10