

**EPIDEMIC OF DENGUE AND
PREVENTIVE MEASURES:
A STUDY BASED IN THE
KALMUNAI RDHS AREA,
SRI LANKA**

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Abstract

The Kalmunai RDHS area is identified as a vulnerable zone where number of vector-borne diseases were reported in the recent past. Many people including children were affected in terms of death and hospitalization in the region. Thus, this study significantly focuses on why the epidemic of dengue is extensive even though, the dengue prevention activities are carried out by the respective health institutions in the area of research. The main objective of this study is to identify the recent trend of spreading dengue, and to explore the prevention activities carried out by the Kalmunai RDHS. Data for this research have been gathered from both primary and secondary sources. The observation and the key informant interviews have done for collecting primary data. As a secondary data, the statistical report on dengue has been collected from regional epidemiology unit of Kalmunai RDHS office, and also relevant secondary information have been gathered from newspaper, literature, electronic sources, recently conducted researches and reports. Finally, the study found that there were some key preventive measures made and followed up by all MOHs in the region, such as, awareness programs; Cleaning campaign and Shramadhana activities; house to house inspection and issuing handbills and leaflets, public announcements and other relevant actions were taken, especially during the National Dengue Week and National Mosquito Control week and Fogging / spraying DTI chemicals to the breeding sites and highly affected areas were identified by the Public Health Inspectors. Further, this research can be extended in future to discover new results and findings which may vary from existing knowledge of this study.

Introduction

Dengue fever (DF), the most important arboviral disease affecting humans, is an increasingly significant cause of morbidity and mortality in tropical and subtropical regions

around the world. Over half of the global human population lives in areas of risk, and more than 100 countries are experiencing DF and/or dengue hemorrhagic fever (DHF) epidemics in the early 21st century

(Guha Sapir and Schimmer, 2005). Dengue is one of the most critical public health hazards which has made severe impacts in the recent past in Sri Lanka. Dengue, an arboviral infection, has emerged as a serious public health problem in several regions in the island. From January to September 2009, Dengue patients numbering 25,301 have been reported and hospitalized throughout the country and 249 patients have died due to this disease (Peiris, 2009).

According to the World Health Organization's (WHO) status, from 1st January to 7th July 2017, the Epidemiology Unit of the Ministry of Health (MoH) Sri Lanka reported 80,732 dengue fever cases, including 215 deaths. This is a 4.3 fold higher than the average number of cases for the same period between 2010 and 2016, and the monthly number of cases exceeds the mean plus three standard deviations for each of the past six months. Based on sentinel site surveillance for the past seven years the expected peak months of May to July coincides with the south-western monsoon which commences in late April (WHO – Disease Outbreak News, 19 July 2017). Many people have been victimized in terms of hospitalization and death in the island and numbers of people have been affected in the Kalmunai Regional Health Services area. From 2006 to 2016 June, dengue patients

numbering 2,917 have been reported all over the region, and from 2009 to 2016 June, 23 patients have died due to this disease in the Kalmunai RDHS area (Regional Epidemiologist, RDHS, Kalmunai - 2016).

Many preventive measures has been implemented by all MOH offices in the Kalmunai RDHS region in order for preventing dengue from the region. Community-based programs are increasingly being touted as the key to successful control programs (Gubler and Clark, 1996; Rifkin, 1996; Parks and Lloyd, 2004; Parks et al., 2004), recognizing the fundamental importance of mobilizing and channeling household-level behaviors and capacities in eliminating mosquito breeding sites, reducing exposure, and targeting efforts in many countries experiencing dengue and its trauma. The Government of Sri Lanka is very keen on implementing many programs and policies to control and prevent Dengue. Thus, community participation is one of the key measures which is keenly followed by the government in the successful Dengue prevention activities. Many activities have been implemented in eradicating dengue with the participation of the public. And these activities have been planned to implement in-collaboration with the Ministry of Health, government hospitals and the

Medical Officers of Health (MOH) divisions in the island-wide.

Kalmunai RDHS has been playing pivotal role in controlling and preventing Dengue in the areas coming under its purview. There are thirteen (13) MOH offices come under its authority. The RDHS has been functioning within the region in order to control Dengue by accelerating and implementing various forms of preventive measures. Thus, this study is aimed at understanding the recent trend or endemic of dengue during the last 10 years, and to identified the preventive measures carried out by the RDHS, Kalmunai.

Research Problem

The dengue disease is a challengeable health problem in the national as well as global level. And various prevention programs were implemented by the Sri Lanka government. Even though, many prevention measure carried out by the institutions, the expansion of dengue is still apparent, and its impacts also severe and broader in the recent past in Kalmunai region. Thus, in this study, the researcher paved an attention as how the endemic of dengue recorded in the study area, and, what types of dengue prevention strategies or mechanism have been implemented in the Kalmunai RDHS region in order to control this health dilemma.

Objectives of the Study

The following objectives are the specific objectives of this study: (1) to identify the recent trend of spreading dengue in the Kalmunai RDHS region, and (2) to understand the preventive measure to control or eradicate dengue from the Kalmunai RDHS region.

Research design and Methods

Basically this research used both qualitative and quantitative descriptive methods. The information and data for this research have been collected from primary as well as secondary sources. Primary data have been collected mainly from structured interviews with key-informants and observations. The following groups of people have also been interviewed; *Regional Epidemiologist – 01, Medical Officer of Health (MOH) – 03, Public Health Inspector (SPHI) – 01, and University Academic – 01.* Secondary data have been collected from government statistical department, RDHS and MOH records, books, publications, journal articles, e-sources, previously conducted research and other reports.

Literature Review

A study by Jerry Spiegel et al. (2005) observed, Barriers and Bridges to Prevention and Control of Dengue in the Americas and the Asia-Pacific region, the important elements of successful control programs are identified as community ownership, partnership with government,

leadership, scalability, and control of immature mosquitoes. Case studies in Cuba, Guatemala, Singapore, Thailand, Indonesia, and Vietnam, the limitations of control approaches that fail to take into account the complexities of ecological and social systems are presented. Bridges to effective control are identified as the basis for adaptability, both of control programs to the mosquito vector's changing behavior and of education programs to public, regional and local particularities, as well as transdisciplinarity, community empowerment, the ability to scale local experiences up to the macro-level, and the capacity to learn from experience to achieve sustainability. In their conclusion, indicated some recommendations as through the catalyst of implementation for the benefit of vulnerable communities and the application of an integrated SES approach, to forge bridges among the myriad of social actors who heretofore have followed separate agendas.

Arunachalam et al. have been done a research titled "Eco-bio-social determinants of dengue vector breeding: a multicountry study in urban and periurban Asia" published by the World Health Organization in 2009 (*Dengue Bulletin* 2010:88, Pp 173-184). This research has taken samples from each urban or periurban areas from selected six Asian countries, namely; India, Myanmar, Sri Lanka, Indonesia, Philippines and Thailand for conducting household surveys, background surveys and entomological surveys, all study sites followed a joint protocol based on area clusters. It demonstrates the

factors that influence mosquito breeding and the production of adult *Aedes* mosquitoes are many and complex and the public health response should extend beyond larviciding or focal spraying and, traditionally, communities have looked to public dengue control services to carry out the job, normally through insecticide fogging, but such services tend to apply a one-size-fits-all approach. For integrated vector management to succeed, ways must be found to stimulate communities, as well as their political and religious leaders, to join the battle against dengue. It is very critical for constructing closer interaction between communities and municipal dengue control services to ensure the success of dengue control, but several specific mechanisms for dengue control programs can be derived from this study. So, it did not deem the dengue control initiatives by using community engagement as an important prevention strategy.

Zakus and Lysack (1998) in their research on 'Revisiting community participation' published by the Oxford University Press (*Health Policy and Planning*; 13(1): 1-12). It has reviewed the value of community participation and most significant difficulties related to the evaluation of community participation, and examined those problems appear as most intractable. Many individual factors have contributed to the achievement of greater community participation in health promotion activities or initiatives. This article contains the nature of the concepts of 'Community' and 'Participation' and Predisposing conditions for

community participation in health. For better community participation, the genuine support from health professionals and managers, with political/administrative system. So it is necessary to consider the contributor's point of view as issue.

Rowe and Frewer (2000) in their research article "Public participation methods: a framework for evaluation", have explained about the public involvement in science and technology policy making process and the link between participation and communication process. This research article evaluates participation methods in science and technology in terms of communication strategies. In this article, authors divided the level of participation into two; one is low level participation and, other one is high level participation. Higher level may seek some degree of public input, as in the solicitation of public opinion or the active participation of public representatives in the decision making process. The lowest level involves top-down communication and one-way flow of information, when the highest level is characterized by dialogue and two-way information exchanges. They pointed out that the technical issues should be left in the hands of experts and scientists, and they suggested that the environmental policy based on the public conceptualization of risk fails to adequately protect fundamental human rights to health and liberty. Few researches, however, have been conducted based on the mechanism for involving public at higher levels of input into decision making in communication. In this paper, authors

tried to analyze that the 'input' is the key slogan, differentiating participation methods from other communication strategies. So, this research article considers community participation on the basis of science and technology or in communication phase, not to contain the disease prevention strategies or the programs.

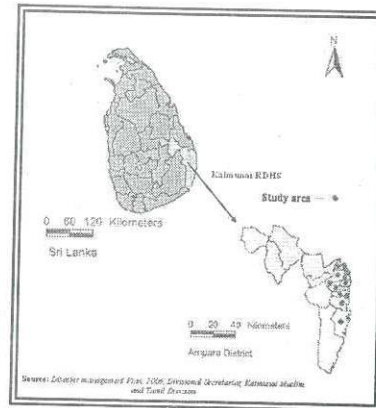
Julia Rosenbaum et al. (2010) carried out a research on "Community participation in Dengue prevention and control: A survey of knowledge, attitude, and practice in Trinidad and Tobago". It paved clear notion of the need for broad-based environmental sanitation strategies when planning community-based mosquito control initiatives for the prevention and control dengue in Trinidad and Tobago. This study explores public opinion about individual, collective, and governmental responsibilities in addressing these issues and priorities are of particular importance designing community-based programs. The study conducted based on knowledge, attitudes, and practices regarding dengue, its prevention and control, level of awareness about dengue and its etiology. Further, the household pest problem related with mosquito nuisance particularly from night-biting mosquitoes, economic losses, ruined food, and unreliable water supply were identified as factors associated with *Aedes aegypti* abundance, was major environmental sanitation issue of the household in

rural areas in Trinidad and Tobago. Thus, the research was carried out on the basis of public concern about environmental sanitation issues in dengue prevention and control, specifically in the rural segments of Trinidad and Tobago which is located in Latin American region, however, this study did not considers community involvement in dengue prevention or control in the context of Sri Lanka or any segment in the coastal area of the Kalmunai RDHS region.

Background of the Study Area

This paper aims to explain the background of the study area with the main focus on the recent trend of Dengue epidemic and the prevention activities taken in the study community under the direction of Kalmunai RDHS division. This research basically focuses the Kalmunai RDHS area which is located in the south eastern coastal region of Ampara district (Majeed, A. 2001). It is one of the districts situated in the Eastern Province of Sri Lanka that had the misfortune of facing many disasters in the recent past that have severe impacts on its people.

Map 1: Map of study area



Amapara is a densely populated district, especially in its northern coastal area. It has a population of 6 percent of the total population of 648057 and has an ethnic composition of 43.59% Muslims (282,484), 38.73% Sinhalese (251,018), 17.40% Tamils (112,750) and others 0.15% (956) according to the information released for 2012 by the Department of Census and Population (Census and Population Report, 2017).

There are other ethnic groups such as Burgers and Malays in negligible numbers scattered around the district. More than 97% of the Muslims and the Tamils live in the coastal area of the district. This coastal area which forms the Southeastern region with geographical distance of about 50 miles long and 10 miles wide, and it is bordered by Periyaneelavanai on the North, Paanama on the South,

Ampara town on the West and the Bay of Bengal on the East (Majeed, A. 2001).

The total population of Kalmunai RDHS area is (According to the Department of Census and Statistics; 400,120 (Table 1 shows the population of the research area by MOH division), and most of the people (approximately 70%) are Muslims in this village and others are also living village by village with their own cultural practices. At the same time, they are having common political, economic, sports, administrative practices and traditions with mutual understanding and solidarity in their common social life and interaction.

Kalmunai area particularly has many resources such as water and land for economic activities (fishing, farming and cultivation), self-employment opportunities and skillful people to suit the jobs; therefore, this area consequently has several special characteristic aspects. The Kalmunai region basically is densely populated area and it covers with continuous settlement patterns geographically. The special character of this area are the marine source on the East, extended paddy land on the West, and business sectors, government and non-governmental offices and small scale industries which determine the life style of the people (Interview: 01). So, this living condition and

new environment also had an important impact on spreading communicable diseases. The densely life and changing of climate also create mosquito breeding sites in the coastal and bordered (relocated) villages. So, the container cleaning and other environment related works became challengeable elements for protecting people from diseases in this area.

The life style of the people is determined on the basis of religion and other social and cultural values. Traditional and modern rituals are also being practiced by them, especially during the marriage, circumcision, and other religious based spiritual functions. like 'Kodiyeaththa Palli' events (ceremonial function celebrate in Kalmunai beach mosque annually for spiritual activities as well as for entertainment) which amalgamate many people together from three communities. Some time, this mass crowd will also give the space to transfer the communicable diseases like dengue and malaria, especially among children and women (Interview: 01).

For this study, the Southeastern coastal region (Pottuvil on the South and Kalmunai on the West) is covered in order to understand the spread of dengue and key dengue prevention activities done in the study community respectively. So, this area

also comprises the following Medical Officer of Health (MOH) Divisions of Kalmunai North, Kalmunai South, Sainthamaruthu, Karaitivu, Nintavur, Addalaichenai, Akkaraipattu, Alayadivembu, Thirukovil, Pottuvil, Sammanthurai, Navithanveli, and Irakkamam. The table 2 shows the

detail and the percentage of the population living in thirteen (13) Medical Officer of Health (MOH) Divisions which are coming under the supervision of Kalmunai Regional Directory of Health Services (RDHS).

Table 1: Population Distribution in Kalmunai RDHS area

<i>MOH divisions</i>	<i>Population</i>	<i>Percentage of the people (100%)</i>
<i>Kalmunai North</i>	29,713	7.4%
<i>Kalmunai South</i>	44,509	11.1%
<i>Sainthamaruthu</i>	25,412	6.4%
<i>Karathivu</i>	16,781	4.2%
<i>Nintavur</i>	26,329	6.6%
<i>Addalaichenai</i>	42,165	10.5%
<i>Akkaraipattu</i>	39,223	9.8%
<i>Alaiyadivembu</i>	22,411	5.6%
<i>Thirukovil</i>	25,187	6.3%
<i>Pottuvil</i>	34,749	8.7%
<i>Sammanthurai</i>	60,596	15.1%
<i>Navithanveli</i>	18,672	4.7%
<i>Irakkamam</i>	14,373	3.6%
Total	400,120	100%

Source: Department of Census and Statistics, 2012

These areas have suffered severely during the past 30 years due to armed conflict. The effects of the conflict include: internal displacement, damage to houses and infrastructure, loss of livelihoods and a high percentage of single-headed households (in particular, women-headed households). As a result, more than half of the populations live

below the poverty line. In addition to the conflict, this region was affected by a huge disaster of Tsunami in 2004 that struck and shattered the eastern coastal belt of Ampara district. In fact it has caused death toll of 10,436, and injured people were 75,172, and damaged houses were 18,810 (www.statistics.gov.lk).

Dengue also has remarked as another disaster for the last ten years, especially in 2006 and 2016 June in the region. From 2006 to 2016, dengue patients numbering 2,917 have been reported all over the region. And in the same period, there were 23 patients have died due to this disease in Kalmunai RDHS area.

Results and Discussion

Before understanding the dengue prevention activities of all MOHs in Kalmunai RDHS, It can be given the past experience of Dengue in the region from 2006 to 2010, which helps the researcher to examine the

(Regional Epidemiologist, RDHS, Kalmunai - 2016).

Therefore, in the recent past (particularly, from 2009 to 2015) as well as in 2016 also the Kalmunai RDHS is highly concentrated on dengue preventive task not only in settlement area but also in all relocated schemes in the region. widespread of dengue and to evaluate the preventing programs to control dengue. And also these data will attempt to illustrate the growth rate of affected dengue cases reported to the Epidemiology unit from different areas in different numbers.

Table 2: Dengue Situation by MOH area in Kalmunai RDHS (2006 – 2016 June)

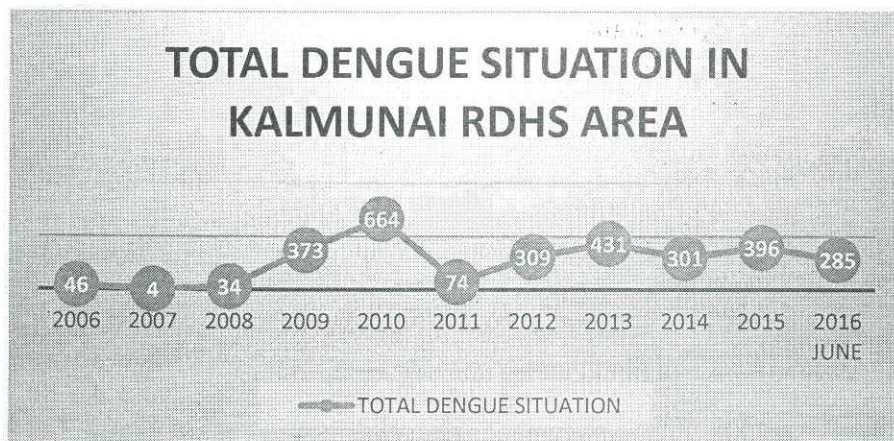
<i>MOH Area</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016 June</i>
<i>Kalmunai South</i>	07	01	05	103	105	06	16	107	41	67	141
<i>Kalmunai North</i>	04	00	01	116	173	06	13	12	25	40	60
<i>Sainthamaruthu</i>	03	01	11	17	19	04	29	35	03	38	13
<i>Karathivu</i>	02	00	01	31	157	03	08	21	04	14	20
<i>Nintavur</i>	15	00	03	13	14	14	37	48	33	15	16
<i>Addalaichenai</i>	06	01	02	18	39	03	05	22	05	43	06
<i>Akkaraipattu</i>	05	01	02	10	59	09	11	56	129	69	01
<i>Alaiyadivembu</i>	02	00	00	02	16	04	02	08	32	37	02
<i>Thirukovil</i>	01	00	00	00	05	06	07	00	06	15	11
<i>Pottuvil</i>	00	00	01	01	01	01	05	08	03	18	07
<i>Sammanthurai</i>	01	00	05	47	50	12	167	100	14	19	01
<i>Navithanveli</i>	00	00	03	13	24	04	07	07	06	18	06
<i>Irakkamam</i>	0	00	00	02	02	02	02	07	00	03	01
Total	46	04	34	373	664	74	309	431	301	396	285

Source: Regional Epidemiology Unit, Regional Directory of Health Services, Kalmunai, 2016

The above table 3 shows the dengue cases reported to the Kalmunai Regional Epidemiologist from thirteen MOH in the coastal belt of Ampara District, Sri Lanka. According to the above information, the highest numbers (599) of dengue cases were reported from Kalmunai South MOH area, and 450 cases were reported in Kalmunai North MOH area respectively and very low number (19) of dengue case was

reported from Irakkamam MOH area during the last 10 years from 2006 to 2016 June. These data clearly displays the conditions prevented during the period of ten years from 2006 to 2016 June and it includes death and the affected cases respectively. The following graph shows the prevalent of dengue in the study region in different levels in different phases.

Chart 1: Wide-spread of Dengue in Kalmunai RDHS Region (2006 – 2016 June)



Source: Regional Epidemiology Unit, Regional Directory of Health Services, Kalmunai, 2016

The highest fraction of dengue (664) was recorded in the period of 2010, and a lower rate was reported in 2007 respectively. At the same time, the average rate of spread of dengue has been reported as 309; 431; 301; 396 and 295 in the year 2012; 2013; 2014; 2015 and 2016 accordingly. Thus, the

Last five years clearly highlights the fact that the epidemic of dengue is still reported as continuous public health problem in the study region. So, the data shows that the level of dengue endemic is not declining in the last five years. However the preventive strategies need to be further improved in the Kalmunai

region in order for controlling this health concern.

On the other hand, the death cases of dengue were also reported in Kalmunai region, particularly in the year 2009 and in 2016. The following data (Table 4) shows the detail of reported and death cases in the study region.

Table 3: Number of Cases and deaths in Kalmunai RDHS (2009 - 2016)

Year	2009	2010	2011	2012	2013	2014	2015	2016 June	Total
No. of Cases	373	664	74	309	431	301	396	285	2833
No. of Death	07	07	00	03	02	01	01	02	23

Source: Regional Epidemiology Unit, Regional Directory of Health Services, Kalmunai.

According to the Regional Epidemiology report, 23 death cases were reported in Kalmunai region from 2009 to 2016. On the other hand, numbers of dengue preventive measures have been carried out by 13 MOH offices in Kalmunai region. There are some key preventive measures made and followed up by all MOHs in the region, such as; awareness programs; cleaning campaign and Shramadhana activities; House to house inspection and issuing handbills and leaflets, public announcements; Fogging / spraying DTI chemicals to the breeding sites etc. These strategies were done by 13 MOH divisions in

Kalmunai region to control dengue successfully. To implement all these activities, the dengue supervisions are continuously made under the coordination of RDHS, Kalmunai, Sri Lanka.

Dengue Prevention Activities in Kalmunai RDHS

The role of MOH Offices is very essential under its RDHS to prevent people from diseases, especially communicable diseases as well as, to advice the people regarding non-communicable diseases around the country. The MOH Office is the government body which has been playing vital role in Sri Lanka in

order to provide better health care to the community. Public awareness, Anti-Natal Clinic, Well-Baby Clinic and the community health observation are the key mechanisms of MOH offices in this country (Interview 02). The Dengue prevention activities of 13 MOH divisions in Kalmunai region are generally similar, and based on their social and cultural backgrounds. They handle various systems and mechanism as important tools to prevent dengue. So, it can be emphasized that those kinds of activities or programs are carried out in general manner because they have a common character and basic aspects on dengue prevention in the study area.

Awareness Programs

The awareness is consequently using as the key measure in any disease prevention programs at rural level, regional and national levels. The main target of this awareness is to advise people and to help them create a good environment free from diseases themselves. In such a way, there are many awareness strategies carried out from time to time by 13 MOH divisions in the Kalmunai RDHS area, especially they have planned number of awareness programs at various levels with different techniques in this region as follows; awareness for school children, awareness for teachers in schools, awareness for officers and

servants in government sectors, regular awareness for people how to clinics (daily or weekly or monthly) to MOH of their area, and public awareness for community division by division or area by area on village basis. Awareness programs for school children are commonly conducted by all MOH divisions in the Kalmunai region. The Public Health Inspectors (PHI) regularly visit every school to observe dengue mosquito breeding sites in order to destroy it and provide safe environment to students (Interview 03). Therefore, each MOH division conducts awareness programs for school children to create and maintain safe environment to them. This kind of awareness program has been carried out not only for school children but also for Teachers in same schools in all MOH areas to make them aware of dengue disease and its terrible affects. These kinds of awareness programs were carried out in the Kalmunai North, Kalmunai South, Karaitivu, Akkaraipattu, Navithanveli, Nintavur, Addalaichenai, Irakkamam, Pottuvil, Sainthamaruthu, Thirukkovil, Alayadivembu and Sammanthurai, as dengue prevention strategy in this region. At the same time, school children participated in road rally and performed street drama to make public aware of the severe conditions of dengue affected patients, and for realizing the fact of trauma of this disease. Through these means of public rally and drama, the messages

on dengue they have made it reached the minds of local people. These programs have been carried out with the participation of many officers and workers from health sector. The Medical Officers of Health (MOHs), Superintendent of Public Health Inspectors (SPHIs), Public Health Inspectors (PHIs), and volunteer workers (paid or unpaid) were highly involved in this task.

Other type of awareness programs have been conducted by each MOH office during their daily or weekly or monthly clinic sessions, especially to pregnant mothers. There are two types of clinics exercised, such as, Anti-Natal Clinic (ANC) and Well-baby clinic. So, the all MOHs in the Kalmunai region provided information to conduct awareness program for pregnant mothers continuously during the clinic time. So, all MOHs not only in the Kalmunai but also in other parts of the country, they are conveying dengue or diseases related messages to the public through various awareness programs. They carried out those programs and plans especially during National Dengue Control Week events and National Mosquito Control Week observation newly declared by the Ministry of Health, Sri Lanka. The Non-governmental organizations, local community-based organizations and clubs have contributed financially to conduct this dengue prevention mission.

Cleaning Campaign and Shramadhana Activities

To prevent dengue, the cleaning campaign and shramadhana were handled by the MOHs in Kalmunai as an important practice. Through these actions, in the research area, many places in terms of mosquito breeding sites were identified and destroyed containers and other unwanted things in the places. SPHIs and PHIs regularly make visits to the suspected and informed or infected location and identify the real breeding sites (Interview 04). So, if a place is identified as a mosquito breeding site, then the necessary action can be taken to safeguard the environment and save the area from Alpha infection. School children, Teachers, Officers and workers from health sector, volunteer (payable or non-payable), Grama Niladhari (G.N), Samurdhi Development Officers (SDOs), workers from local government (from Pradeshiya Sabha and Muncipaipal council), religious leaders or community leaders and also local Politicians (in some situations) are amalgamated these cleaning or shramadhana activities. With the participation of these groups the action would be done i.e. Collecting containers from schools, government offices, bus stands, playgrounds, houses, tire shops, bare lands, markets, Mosques, Kovils, Temples and other public places (Interview 05). Another important thing to be noted is that the

government of Sri Lanka also has instructed the Civil Security Force (CSF), Special Tasks Force (STF), Sri Lanka Army and Police to give their potential support and involvement at village level dengue prevention activities. In this manner, Sri Lanka Police and other forces have also contributed in various dengue prevention programs in the Kalmunai RDHS region.

House to House Inspection

House to house visits are mainly carried out by PHIs in all MOH divisions. House to house visit varies from one MOH area to another. The main aim of this visit was to determine the living environment of people in the area and to advise or warn them to keep their environment cleaned. House to house visit in Kalmunai North, Kalmunai South, Karaithiyu MOH areas was different from other area because they were reported as highly dengue affected divisions from the period of 2009 to 2010 in Kalmunai RDHS. So, continuously PHIs visited every area and investigated and observed places, and then, paste stickers on the wall of houses based on the cleaning condition of the surroundings. If the surrounding is clear, the PHI pastes the green color sticker indicating clean environment. Nevertheless PHI pasted red color sticker which was the warning alert of the household who has to clean the area as quick as possible. Otherwise, the particular

family of the house would be punished under spot fine or any other legal action taken by the Police (Interview 05). These actions and mechanisms would promote public to keep their environment cleaned and aware of dengue surveillance.

Public Notice and Announcement

Generally, dengue related messages have reached public through handbills or leaflet, and the public posters, cutout and the banners which were hanging in the public places and imposed in near to schools and other public buildings to show the dengue message clearly. At the same time, public information on dengue has reached through announcement given by Mosques, Hindu Kovils and Buddhist Temples. In some situation, this message would also expresses through speaker announcing by MOH office or Police at any emergency needs (Interview 05).

Fogging or Spraying Chemical

This is actually a last option of dengue prevention measure. The fogging or spraying chemicals is highly needed to mosquito breeding sites and to highly dengue infected or vulnerable areas. And also it is very expensive and hazard to the people and environment. But, if PHI identified suitable places (breeding sites), the fogging would be made by technicians (Interview 06). This kind of work also carried out by some

MOH divisions in the Kalmunai RDHS, specifically Kalmunai North, Kalmunai South, Addalaichenai, Nintavur, Sammanthurai and Karaithiyu MOH areas. The aforesaid all dengue prevention programs were implemented and coordinated by 13 MOH offices in the region. Those preventives are highlighted as important mechanisms to control dengue in whole MOH divisions in the Kalmunai RDHS. Sri Lanka has many strategies or mechanisms to prevent dengue from the country. The government and the Ministry of Health also are very keen and interested to watch every moment of dengue matters in the country to eradicate dengue completely. Dengue is a dangerous vector-borne disease in Sri Lanka, as well as, in the study area. It affects the young and the old, the rich and the poor alike, especially among those living in densely-populated urban areas in tropical regions. In Sri Lanka, the following control strategies have been established: (1) Surveillance: it includes the following categories: (a) Disease surveillance, (b) Vector surveillance, and (c) Laboratory active surveillance; (2) Vector control, (3) Social mobilization, (4) Clinical management of DF/DHF cases and (5) Emergency response. To coordinate all these activities, a dengue task force has been established at the national level. In this approach, the Kalmunai RDHS also has promoted all MOH offices

coming under its authority, to implement such programs and upgrade their existing systems or strategies. Numbers of dengue preventive measures have been carried out by 13 MOH offices in the Kalmunai region. There are some key preventive measures made and followed up by all MOHs in the region as follows:

1. Awareness programs: to school children, and public at various levels through many different efforts like street drama, road rally and etc.
2. Cleaning campaign and Shramadhana activities with the participation of students, teachers, government officers, and volunteers, people from local government bodies and health sectors, as well as, few of the people of local community.
3. House to house inspection and issuing handbills and leaflets, public announcements and other relevant actions were taken especially, during the National Dengue Week and National Mosquito Control week.
4. Fogging / spraying chemicals to the breeding sites and highly affected areas were identified by the Public Health Inspectors.

These strategies were done by 13 MOH divisions in Kalmunai region to control dengue successfully. To implement all these activities, the dengue supervisions are continuously made under the coordination of RDHS, Kalmunai. However, the public participation could not be effective in most preventive strategies in the region, even though the Kalmunai RDHS is well equipped with human and technical resources.

Conclusion

The wide-spread of dengue has been found as a serious public health concern in the Kalmunai RDHS area, according to the analysis of data covering the period from 2006 to 2016 June. In the research area, during the last 5 years the endemic of dengue has been recorded in continuous average level, especially from 2012 to 2016 without any positive declining. The highest rate of dengue was reported in 2010, and it has been controlled in 2011, but sadly, again dengue hazard reported in a notable manner for last five years. To prevent dengue, the 13 MOH areas have played a vital role under the supervision of Kalmunai RDHS. The study revealed that numbers of preventive measures were carried out in the research area at various levels to control dengue. Nowadays, many MOH areas have saved the people from the hazard of dengue. But, in some areas the dengue is still obvious due to some

reasons and factors affecting social and cultural aspects of local community. Through all dengue prevention activities in this region, it can be found that the community involvement was comparatively lower than expected when compared to the participation of health workers, students, volunteers and others from government sectors. The Kalmunai RDHS need to be further amalgamated community participation in future as one of the key preventive measures to control dengue from the region significantly.

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