# Performance Audit Report on Dengue Control Programme Including Prevention and Treatment – 2011/12

Performance and Environment Audit Unit

**Report No : YS/PA/Dengue/2011/02**

**Auditor General's Department**

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## 1. Executive Summary

In Sri Lanka Dengue and Dengue Hemorrhagic Fever have emerged as critical public health problem and severe outbreaks of Dengue Fever / Dengue Haemorrhagic Fever / Dengue Shock Syndrome were experienced during the second quarter of the year 1996 to 2011. Simultaneously, the measures for its prevention and control have been carried out by the relevant authorities in Sri Lanka. The dengue cases and deaths in Sri Lanka were as follows.

| Year | Cases | Deaths |
|---|---|---|
| 2010 | 34,105 | 246 |
| 2011 | 28,473 | 186 |
| 2012 | 44,461 | 181 |
| 2013 | 32,063 | 89 |
| 2014 | 47,258 | 97 |

(Source – Epidemiology Unit)

The Ministry of Health is the apex institution of the country providing high quality, equitable, cost-effective and sustainable health service.

National programmes are needed to implement healthy public policy in development projects in urban and rural areas. Currently, national programmes are being carried out using large amount of resources on dengue control and a major part of the expense is incurred on insecticide sprays and chemical larviciding, and other source reduction activities only during epidemics. But these need to be carried out routinely. In contrast, evidence shows that vector control through larval monitoring, source reduction and personal protection, combined with the good sanitary environment in households and communities have proven to be effective in preventing dengue.

Community participation and social mobilization for behavior modification have begun to show good results in many different settings. Investing in this approach and in integrated vector management will produce the desired results.

Dengue prevention and control procedures should concern every citizen of the country. The objective of national policies is to strengthen the response to dengue within the health sector, facilitate intra-programmatic collaboration and effectively mobilize intersectional collaboration. Although Bacillus Thuringiensis Israelensis is used as a preventive measure for dengue control, its economy, efficiency, effectiveness and environmental compliance were observed during the audit.

The strategies should be aimed at utilizing optimally the currently available interventions based on evidence and at the same time, advocating for intensification of research for the development of a suitable vaccine, antivirus drugs and appropriate diagnostics for dengue. Unfortunately, knowledge about dengue fever does not translate

into action to prevent mosquito breeding. One problem on this area has been the lack of active ongoing partnership between Health Agencies and Committees.

## 2. Introduction

### 2.1 Background

In Sri Lanka, Dengue Fever and Dengue Haemorrhagic Fever are critical public health problems in our day to day life and has become a national issue.

**Dengue Viruses and Disease**

Dengue is caused by four closely related viruses (Dengue Virus 1, Dengue Virus 2, Dengue Virus 3, Dengue Virus 4) transmitted by female mosquitoes of Aedes Aegypti and Aedes Albopictus. Dengue fever, dengue haemorrhagic fever and dengue shock syndrome are disease complexes caused by the dengue viruses. Outbreaks of dengue occur primarily in the living areas of Aedes Aegypti Mosquitoes. The disease is prevalent in most tropical urban areas of the world with periodic epidemics in minor scale over centuries. A vaccine is not available for the prevention of the serious disease and specific treatments are also not available for curing the disease.

Aedes Aegypti, the principal mosquito vector of dengue viruses is an insect closely associated with humans and their dwellings. The water holding containers are favorable to the breeding of mosquitoes. The female mosquito lays her eggs on inner sides of the receptacle just above the water level and eggs are developed to larvae in the presence of water. Therefore mosquito breeding places are more prevalent after rain and floods. Within about a week adult mosquitoes emerge from eggs. It is very difficult to control or eliminate Aedes Aegypti mosquitoes because of their adaptations to the environment make them highly resilient, or with the ability to rapidly bounce back to initial numbers after disturbances resulting from natural phenomena such as droughts or human interventions such as control measures.

**Dengue in Sri Lanka**

In Sri Lanka, dengue is prevalent since 1960s. The disease initially reported from urban areas, has now spreads to semi-urban and rural areas and become a significant public health problem in the country. At present dengue fever is endemic in most parts of the country with periodic outbreaks and is endemic in many urban and semi-urban areas, specially in the wet zone of the country.

**Legal Background**

The surveillance of communicable diseases in Sri Lanka is based on the system of notification in terms of the Quarantine and Prevention of Diseases Ordinance of 1897 and its subsequent amendments. Destroying/ removal of breeding places of the

mosquitoes which spread the disease is the most effective method of preventing and controlling the spread of the disease, and it has become necessary to deal effectively with this health problem from a national perspective by the appointment of a Competent Authority and other officers to be responsible for the implementation of the National Policy. Therefore the Prevention of Mosquito Breeding Act, No.11 of 2007 was enacted on 12 April 2007. Every owner or occupier of the premises who contravenes or fails to comply with any duty or requirements imposed under this legislation shall be guilty of an offence.

**Responsibility**

The Ministry of Health is the apex institution of the country which gives high quality, equitable, cost-effective and sustainable health service. Under the Ministry, there are five national level institutions involved in monitoring, and supervision of work for the strengthening of dengue control, evaluation and providing guidelines to control and prevention activities at Provincial, District and Divisional levels.

i. Epidemiology Unit
ii. Dengue Control Unit
iii. Anti-Malaria Campaign
iv. Health Education Bureau
v. Anti Filariasis Campaign.

The planning and coordination of preventive measures to overcome the spreading of dengue have been carried out by the above mentioned statutory organizations and the Ministry of Health. Their plans have been carried out by the following personnel.

i Regional Directors of Health Services
ii. Regional Epidemiologists
iii. Regional Medical Officers- Anti Filariasis Campaign
iv. Medical Officers of Health
v. Supervisory Public Health Inspectors
vi. Public Health Inspectors
vii. Entomologists
viii. Entomology Assistants
ix. Public Health Field Officers
x. Regional Malaria Officers

Under the Ministry of Local Government and Provincial Councils, Local Authorities have the clear mandatory responsibility for the subject of eradicating mosquitoes leading to dengue. It has also become a legislative obligation of Local Authorities according to the provisions laid down in governing legislation and other relevant legislation. The Local Authorities such as Municipal Councils, Urban Councils and Pradeshiya Sabhas are responsible for preventing dengue in their areas of authority.

Government hospitals are responsible for treating dengue patients by providing comprehensive, high-quality, equitable, cost effective and sustainable health services.

## 2.2. Authority for the Audit.

The Auditor General carries out his duties under Article 154 of the Constitution of the Democratic Socialist Republic of Sri Lanka, to undertake performance audits of public sector bodies and to provide independent reports and assist Parliament to examine the affairs of the public institutions and the activities of the Government. The aim is to improve public sector administration and accountability.

## 2.3. Purpose of the Audit and Reason for the Selection

This topic was selected for the conduct of a performance audit as Sri Lanka experienced a severe dengue epidemic in the recent past and the large quantity of resources allocated for the dengue control at present.

However the impact of preventive activities implemented so far have not been adequate to keep it under control due to the sporadic emergence of dengue epidemics.

The emergence of dengue, its rapidly evolving epidemiology and the economic losses resulting from the disease make a compelling case for accelerating prevention and control efforts. The disease has attracted considerable media attention and received adverse publicity in recent years. Besides causing ill-health and excess mortality, it has also affected socioeconomic development due to loss of man-days and productivity to the country.

## 2.4. Scope of the Audit.

We have obtained an understanding of global and local situation of dengue epidemics, preventive measures taken by the relevant authorities and the responsibility to the extent necessary as a basis to determine the extent for which stated objective could be achieved. The risks related to the achievement of such objectives, findings and recommendations of our Performance Audit are shown in this report.

We expected to focus on the dengue epidemics statistics of the last three years and audit coverage was limited to the Western Province which is most dengue affected

province in Sri Lanka due to the limitation of staff, other resources and time allocation.

## 2.5. Audit Approach and Objectives

The prime objective of this audit is to assess the effectiveness, efficiency, economy and environmental impact of the preventive measures taken by the relevant authorities to overcome the spread of dengue. In order to fulfill the above objective the audit is aimed at;

i. Assessing the effectiveness and efficiency of the surveillance system.
ii. Assessing the economy, efficiency and effectiveness of the utilization of the Government and the World Health Organization funds for dengue control activities.
iii. Assessing the efficiency and effectiveness of provisions in the Prevention of Mosquito Breeding Act, No.11 of 2007 for the control of dengue epidemics .
iv. Assessing the environmental impact of dengue control activities.

## 2.6. Limitations

Limitations are as follows.

i. The performance audit covered only the identified objectives relating to the dengue control activities implemented in the Western Province by the relevant authorities.

ii Extent of the performance audit was limited to a sampling procedure based on time and human resources available for the purpose.

iii Details of the dengue deaths had not been made available to the audit. Therefore, the actual causes of the dengue deaths could not be satisfactorily determined in audit due to the unavailability of the detailed review of deaths.

Some of the officers responsible to provide accurate statistics and the major reasons for deaths due to dengue did not readily respond to the requests for information.

## 3. Detailed Audit Findings, Recommendations and Responses

### 3.1 Breteau Index would be below 5 according to the Guidelines of Anti Malaria Campaign

The following observations are made in this regard.

#### 3.1.1. Breteau Index in the Western Province of Sri Lanka

Breteau Index is considered as the threshold level below which the risk of transmission of the disease is very low. When Breteau Index is more than 5, vector control activities such as fogging, use of pesticides(Bacillus Thuringiensis Israelensis Liquid, Mosquito Dunk) and insecticides (Malethine and Deltacide) and clean-up programmes should be conducted according to the guidelines of Anti Malaria Campaign.The following observations are made in this regard.

**(a)** According to entomology survey reports for Medical Officers of Health, Breteau Indices throughout the year had been more than 5 and after monsoon rains it had increased to more than 20. In general, average Breteau Indices for a year had been more than 10 from 2009 to 2011 in the Western Province as shown below.

| **District** | **Average Breteau Index** | | |
|---|---|---|---|
| | **Year 2009** | **Year 2010** | **Year 2011** |
| Colombo | 16 | 12 | 12 |
| Gampaha | 15 | 17 | 19 |
| Kaluthara | 21 | 17 | 15 |

**Implication**

Dengue vector density had increased to very high levels in the Western Province. Hence, Western Province is subject to high dengue risk after monsoon rains. When the Breteau Index is high, immediate action should be taken to prevent dengue outbreak.

**Recommendation**

Dengue vector control activities should be conducted throughout the year and special dengue clean-up programmes should be conducted immediately after every rainy period.

**Provincial Director of Health Service Response**

"Periodical Entomological Surveys are carried out continuously in the province and the results/reports are sent to all 3 districts, Medical Officers of Health and also the Environmental Police Units. When the Breteau Index is high prompt actions are always taken in addition to the regular Dengue Control activities."

**(b)** Vector surveillance had not been done for 8 divisions of Medical Officers of Health such as Agalawatta, Palinda Nuwara, Meegahatenna, Madurawala, Walallawita, Attanagalla, Divulapitiya and Minuwangoda in the year 2009 due to lack of Entomologists and Assistants.

**Implication**

The risks of the above Medical Officer of Health divisions could not be identified. Hence, the number of dengue cases of these areas in the year 2010 had increased by 538 as compared with the year 2009.

**Recommendations**

Entomologists and Assistants should be recruited according to the cadre. Surveillance of vectors should be an essential routine step in the planning, examination and evaluation of control measures .

**Provincial Director of Health Service Response**

"Entomological Assistants are recruited and trained by the Central Ministry of Health. before the cadre revision on 01.01.2013, there were 17 cadre positions and 10 were in position. Due to the increasing demand of service additional 20 positions were requested and now the total no.of cadre is 37. Yet only 10 are in position. Since 2011, following provisional review meetings decisions and presidential dengue task force decisions, planned for vector surveillance covering the whole province is developed and even with limited resources, entomological activities are now carried out according to this plan. Kindly note that Entomologists and the Entomological Assistants also performed filarial control activities in the province in addition to the above."

**Ministry of Health Response**

"Breteau Index is measured by calculating the no of containers per 100 premises. It is not sensitive index because ability to harbor eggs, larvae and pupae depends on the size and type of the containers. Therefore prevalence/density of vector does not solely determined by the Breteau index , which can be used as a guide to know the vector densities. According to guidelines prepared by Anti Malaria Campaign , to use insecticides and (not in relation to use of Bacillus thuringiensis israelensis) with the level of Breteau Index."

**"Important:** Whenever a serologically confirmed or even a clinically diagnosed Dengue/ Dengue Haemorrhagic Fever patient is reported fogging needs to be carried out around the suspected place of transmission, even in the entomological data, or even if the Breteau Index may be less than 2, if there is evidence of active dengue transmission in the district. "

### 3.2 Usage of Bacillus Thuringiensis Israelensis

The Ministry of Health had imported 10,000 litres of Bacillus Thuringiensis Israelensis and 45,000 Bacillus Thuringiensis Israelensis Dunks and purchased 2,624 litres of local Bacillus thuringiensis israelensis for vector control from 2010 to 2011. The following observations are made in this connection.

#### 3.2.1 Purchase and usage of Bacillus Thuringiensis Israelensis

The Ministry of Health had purchased only 2624 litres of local Bacillus thuringiensis israelensis at a total cost of Rs. 6,372,400 and out of that, 1629 litres remained in the stock as at 12 January 2012.

A sum of Rs.33,563,748 had been spent for purchase of 10,000 litres of Bacillus thuringiensis israelensis from Cuba and those had been distributed among the Medical Officer of Health Offices and Units of the Western Province for the use of dengue vector control activities. However foreign Bacillus thuringiensis israelensis had not been used and unused stocks of 3,130 litres with date of expiry specified as June 2012 remained as at 20 December 2011 in the office of Medical Officer of Health and main store of the Antifilaria Unit in June 2012.

Proper application method and successful feedback method had not been introduced for usage of Bacillus thuringiensis israelensis, by the responsible authorities. They had not been provided with enough Spray Machines and the human resources for the Bacillus thuringiensis israelensis usage.

**Implication**

Although research expenditure amounting to Rs. 1,312,160 incurred by the National Science Foundation for innovation of local Bacillus thuringiensis israelensis, the Ministry of Health had spent Rs.33,563,748 for import of foreign Bacillus thuringiensis israelensis.

Imported Bacillus thuringiensis israelensis was not efficiently used for dengue vector control and therefore cost effectiveness of the purchase of Bacillus thuringiensis israelensis was very low. As dengue vector control system was not functioning properly and economically, it was observed that the use of Bacillus thuringiensis israelensis was not a successful method for Dengue vector control, and therefore Dengue breeding sites would be increasing rapidly.

**Recommendations:**

i. The local product should be promoted for vector control activities because of its effectiveness against three larvae types at low cost than foreign Bacillus thuringiensis israelensis .

ii. Ensure Inter- Sectorial Coordination with all relevant parties in order to achieve maximum results.
iii. Continue monitoring of distribution system.
iv. The distribution process should be evaluated by the management.
v. Progress meetings should be held on timely basis and the Provincial Director of Health Services (Western Province) is responsible for this activity at district level.

**Ministry of Health Response**

"The Ministry of Health had purchased 4000 liters of Local Bacillus thuringiensis israelensis from Private Company at a total cost of Rs. 11.1 million. A sum of Rs. 33 million have been spent for purchasing for 10000 liters of Bacillus thuringiensis israelensis from Cuba."

### 3.2.2. Purchase and Distribution of Dengue Dunks

The Provincial Director of Health Services (Western Province) had imported 45,000 Dengue dunks valued at Rs. 14,175,000 in the year 2011 for vector control activities in Dehiwala area. The product had been imported and applications for issuing mosquito dunks, stickers, and leaflets with safety instructions had been provided by the private company. However, distribution had been carried out by the Government.

The guidelines for the application of Dengue dunk had not been issued by the Anti-Malaria Campaign and technical advice for use of Dengue Dunk had not been provided. The distribution of Dengue dunks had not been closely monitored according to a plan by the responsible authorities. Evidence was not available whether the distribution was being covered in high risk areas in Dehiwala. The progress of the distribution had not been monitored by the management and distribution of dengue dunks had not been completed in time due to lack of proper monitoring system. The company supplying Dengue Dunks had distributed a form to obtain a feedback on the vector control programme, by the Provincial Director of Health Services (Western Province). But, the Provincial Director of Health Service officials were not aware of that comment and any comments had not been received by the Provincial Director of Health Service (Western Province) up to 13 December 2011. Four people had made requests of Dunks by the fax massage on 7 October 2011. They promised to the Provincial Director of Health Service.(Western Province) to give feedback after using this product. But evidence was not available to prove that the responsible person had taken feedback from those who used dunks. The distribution was not supervised by the responsible officer due to absence of poor monitoring process.

**Implication**

i. Financial resources could not be used economically and the stock might remain unutilized as the officers had not been guided properly.

ii. Remedial action had not been taken for deviations from distribution plan.

iii. Main objective had not been achieved due to lack of feedback procedures and lack of necessary facilities for prompt action.

iv. Poor monitoring process.

v. Non-use of financial resources economically.

**Recommendations**

High-risk areas should be identified before distribution of Dunks in the pilot programme. A proper feedback system should be developed in order to evaluate the effectiveness of dengue dunk and after the result of evaluation on effectiveness of dunks and further procurement of dunks should be commenced accordingly. Standard guideline for using dengue dunks should be introduced. The distribution should be carried out under the supervision of responsible persons.

**Ministry of Health Response**

"Central ministry allocated the money and the Technical Evaluation Committee consisting of Deputy Director General – Public Health Services -Ministry of Health,Director of Dengue Control-Ministry of Health, and the Entomologists - Western Province from the Provincial Health Ministry Western Province was appointed. Thereafter approval was given to purchase the Dengue dunks which were used for the pilot project carried out in Dehiwala Medical Officer of Health area with close monitoring including periodical entomological surveys. This study was done by the entomologists Western Province with the entomological team. The pilot project was closely supervised and the technical guidance was given by the provisional entomologists and the Medical Officer of Health Dehiwala through the period. When we try to embark on new activities, there are usually diverse opinions. Since all consider themselves as experts. Still we will have try some of the new developments."

### 3.2.3 Effectiveness of Dengue Dunks

After distributing dengue dunks among some Public Health Inspector areas in Dehiwala from 23 August 2011, Entomological Surveys done by the Entomologist in Medical Research Institute and Anti Filaria Campaign in Dehiwala (breteau index) and the cases reported were as follows.

| | August | September | October |
|---|---|---|---|
| Breteau Index-2011 | 3 | 5 | 6 |
| Number of Patients-2011 | 80 | 79 | 72 |

A marked decrease in the number of patients reported as well as a reduction of the Breteau Index resulting from the use of dengue dunks were not observed .

**Implication:**

The application of dengue dunks had not been properly made and therefore the density of Dengue Mosquitoes had not decreased to a satisfactory level.

**Recommendations**

The application of dengue dunks should be properly supervised to achieve the target.

**Provincial Director of Health Service Response**

"Dengue dunks are used only on breeding places which are not easily accessible for frequently cleaning. Breateau Index and no of patients therefore is a long term indicators of effectiveness of dengue dunks. Also Dehiwala is a very urban area having a floating population, therefore breateau index and the no of patients relationship cannot be taken as a direct indicator but it's a proxy indicator. According to the provisional entomologist report in particular areas dengue dunks are effective. We reconfirm that these dengue dunks are very effective and I recommended this should be introduced whole country. If the government funds are not available it should be bought through the private sector. "

### 3.2.4. Local Bacillus Thuringiensis Israelensis

Local Bacillus thuringiensis israelensis is more effective than the other two products according to the Biological efficacy of Bacillus thuringiensis israelensis formulation of field trials done by Medical Research Institute as shown below.

| Name of Bacillus thuringiensis israelensis | Biological efficacy of Bacillus thuringiensis israelensis formulation |
|---|---|
| a. Local Bacillus thuringiensis israelensis | Aedes Aegypti<br>Aedes albopictus<br>Culex quinquefasciatus |

| | | |
|---|---|---|
| b. | Foreign Bacillus thuringiensis israelensis | Aedes Aegypti |
| c. | Mosquito Dunks | Aedes Aegypti<br>Aedes albopictus |

However, cost of local Bacillus thuringiensis israelensis was less than other foreign products as follows.

| **Product** | **Quantity** | **Cost(Rs.M)** |
|---|---|---|
| Local Bacillus thuringiensis israelensis | 2,624L | 6 |
| Foreign Bacillus thuringiensis israelensis | 10,000L | 33 |
| Mosquito Dunk | 45,000(dunks) | 14 |

**Implication**

The application of local Bacillus thuringiensis israelensis directly affected to the quality and time target of the vector control activities.

**Recommendations**

i. Those products should be evaluated for effectiveness against local Bacillus thuringiensis israelensis with foreign Bacillus thuringiensis israelensis and dengue dunks.

ii. Authorities should take a closer look at the relevant information and analyze them in a productive manner and consider whether there are possibilities to recommend to use local product than the foreign.

iii. The Medical Research Institute and Anti Malaria Campaign should regularly monitor the effectiveness of Bacillus thuringiensis israelensis (foreign and Local) used for vector control including resistance monitoring.

iv. The local product should be promoted for vector control activities because of its effectiveness against three larvae types with low cost than foreign Bacillus thuringiensis israelensis.

**Ministry of Health Response**

"Both Cuban and local Bacillus thuringiensis israelensis are effective only for about a week on average when applied in field conditions. For sustainable control it has to be applied weekly. According to laboratory and field testing using Cuban Bacillus thuringiensis israelensis it is effective against both Aedes Aegypti and Aedes Albopictus. Local Bacillus thuringiensis israelensis effective against culex quinquefasciatus, when applied in high concentrations."

## 3.3 Vector Control Activities

The following observations are made.

### 3.3.1 Rapid Deployment Force

Rapid Deployment Force had been established on 16 July 2011 at Boralesgamuwa for dengue vector control activities. But, only Doctor-In-charge and his driver had been attached to this unit without a duty list or plan or other targeted activities to be implemented.

**Implication**

Officers deployed without specific duty lists had rendered assistance to programmes implemented by other organization instead of carrying out vector control activities of the Ministry of Health.

**Recommendations.**

i. This Force should have been strengthened by providing enough human and physical resources to take rapid actions to dengue vector control by fogging.

ii. Specific targets and time frame should be established.

iii. Corporate and Action Plans should be prepared and monitoring procedures should be introduced.

iv. Follow up procedures should be implemented accordingly.

**Provincial Director of Health Service Response**

"This Rapid Deployment Force is now strengthened with 45 recruited health laborers. They are well trained for searching the breeding places and are provided with necessary equipment ,ladders, overalls, ect. New vehicle which was purchased for the Department of Health Western Province was also provided for strengthening their activities. Also this Rapid Deployment and works on a rolling plan, and they have conducted vector control activities even at Presidential Sectretariat and the Temple Trees, etc. Being a qualified person MOIC-RDU knows his duties therefore no need of a special duty list. According to the MOOH have got experience in the field work claims that this team is very effective. "

### 3.3.2. Staff of the Vector Control Programme

According to the guidelines for use of chemicals for vector control (Annex) stated that a spray team should consist of one Public Health Inspector or Public Health Field Officer trained for space spraying and three spray machine operators. It was observed that the 9 Spray Machine Operators were attached to Colombo Public Health Inspector offices.

**Implication**

Vector Control task had not been achieved because fogging function had not functioned properly.

**Recommendation**

Adequate staff should be provided for an effective fogging function and should be carried out according to the guidelines for use of chemicals for vector control.

**Provincial Director of Health Service Response**

Response was not given**.**

### 3.3.3. Distribution of Dengue Dunks

The following observation were made at the audit inspection carried out on 22 November 2011 at Lake Crescent in Dehiwala in which households were selected for distribution of dengue dunks.

(a). Lack of staff in Medical Officer of Health Office Dehiwala for proper distribution of dunks.

(b). Equipment and facilities had not been provided to relevant officers for vector surveillance and application of pesticides to places like roof gutters, water tanks, air conditioners and slabs.

(c). Householders were not aware of solid waste management at satisfactory level.

(d). Some of the beneficiaries had not applied the dengue dunks provided by the Medical Officer of Health.

**Implication**

Lack of human resources and equipment causes inefficiencies of vector control activities. Medical Officers of Health and the staff had not encouraged the public individually to change their behavioral pattern for controlling dengue.

**Recommendations**

Adequate human resources and equipment should be provided to carry out vector control activities. The public should be made aware of their responsibility for solid waste management and vector control thoroughly.

As a long-term control measure, larval source reduction activities should be carried out through environmental management such as regular solid waste disposal and container removal programmes by the Municipal Council staff and field health staff.

Further, these officers should conduct clean up campaigns with the assistance of the public and non-governmental organizations, with the support of the field staff in Medical Officer of Health offices in high risk areas.

**Provincial Director of Health Service Response**

"The staff categories at the MOH office including Medical Officers, PHI, PHM work at the fullest capacity, in collaboration with the local dengue control committees and the volunteers of the area. Provincial Entomologists and the MOH-Dehiwala closely supervised and monitored the dengue dunk distribution activities, though some PHI did not carry out the distribution properly.

**For observation of (c)** – I have participated personally for some awareness programmes conducted in this area and the participation of householder were at satisfactory level. In addition, public is raised during every households survey. Awareness on solid waste management only is not adequate, but the local government authorities too have an important role in solid waste management of the area."

### 3.3.4 Space Spraying Programme

Space Spraying Programme was conducted by Anti Filaria Control at Boralesgamuwa from 25 July 2011 to 01 September 2011 including Colombo Public Health Inspector areas where high dengue cases were reported as follow.

| Medical Officer of Health Area | Date of Fogging | Breteau Index before Fogging | Breteau Index after Fogging |
|---|---|---|---|
| Boralesgamuwa | 29/7/2011 | 4 | 4 |
| Kolonnawa | 5/8/2011 | 14 | 11 |
| Maharagama | 16/8/2011 | 2.6 | 7 |

| | | | |
|---|---|---|---|
| Nugegoda | 22/8/2011 | 1.9 | 13 |
| Boralesgamuwa | 28/8/2011 | 4 | 5 |

Accordingly, it was observed that, in some instances where the vector densities had not been decreased or remained unchanged even after the implementation of Spraying Programme in the MOH areas of Nugegoda, Kolonnawa, Maharagama and Boralesgamuwa.

Evidence was not made available on daily insecticides application forms, according to the guidelines for use of chemicals for vector control. (Annexure 2)

**Implication**

Space Spraying Programme was not conducted effectively to achieve the targets.

## Recommendation

(i) Space Spraying Programme should be well planned, conducted effectively, supervised properly and follow up actions should be taken .

(ii) Space spraying of insecticides in the form of thermal fogs should be carried out around all areas from which dengue cases have been reported to minimize breeding sites and to achieve sustainable reductions in vector densities.

**Provincial Director of Health Service Response**

"To achieve the best results, space spraying of insecticides should be done in parallel with other measures such as source reduction. However even after the maximum efforts, optimal community participation for source reduction was very difficult to obtain Dehiwala, which is a very urban area having a significant proportion of a working population. "

## 3.3.5 Provide Facilities for an Effective Fogging

Although 330 fogging machines had been recommended for purchase according to the Action Plan of Dengue Control Unit, only 134 machines had been purchased during the years 2009,2010 and 2011. Sufficient fogging machines had not been provided to the Western Province in which heavy dengue outbreaks were reported. However, protective clothing and equipment had not been provided for fogging staff. Number of fogging machines provided for Western Province had been as follows.

| District | Number of Medical Officer of Health Offices | Number of Fogging Machines Provided |
|---|---|---|
| Colombo | 12 | 7 |
| Gampaha | 16 | 5 |
| Kalutara | 11 | 3 |
| | 39 | 15 |

**Implication**

Fogging had not been done properly because of unavailability of sufficient fogging machines. Therefore mosquito density had remained without being controlled effectively.

**Recommendations**

i. Adequate number of fogging machines should be purchased and a proper system of maintaining should be arranged and protective cloths and equipment should be provided for fogging staff.
ii. Integrated Vector Control Programme should be continued with more attention on forecasted high risk areas.
iii. All persons involved in the application of space spraying must wear overall protective clothes.

**Provincial Director of Health Service Response**

"Thirty nine MOH offices were in Western Province."

**Ministry of Health Response**

"It was decided to provide one new fogging machine per MOH area, amounting to 330 fogging machines. Some MOH areas already had fogging machines in addition to the fogging machines possessed by Anti Malaria and Anti Filariasis Offices which too are mobilized for fogging operations in MOH areas when necessary. In 2012, 75 fogging machines were purchased. One hundred and thirty four fogging machines were purchased from the year 2009 to 2011.

In 2012, 500 sets of personal protective equipments (PPE) purchased and distributed to relevant field officers on priority basis steps are taken to purchase and distribute PPE to rest of the relevant staff in 2013."

### 3.4 Disease Surveillance

Timely notification of dengue patients to the relevant authority is very important for the success of Disease Surveillance System and to implement the successful control activities. The following observations were made, in this regard.

#### 3.4.1 Technology Usage

Though, the computers, Internet and E- mail facilities had been provided to most of the Medical Officer of Health Offices and hospitals, dengue notifications had been sent by post without using e-mail facilities in the years 2011 and 2012

**Implication.**

The information of dengue patients had not been reported promptly from the hospitals to Medical Officer of Health, Regional Epidemiologist, Regional Malaria Officer / Regional Medical officer/ Filariasis officers, Epidemiology Unit and National Dengue Control Unit.

Timely notification of information on dengue patients to relevant authorities is very important to achieve objectives of the the Disease Surveillance System. Lack of timely notification resulted in the collapse of the Disease Surveillance System. As a result of this, dengue control activities could not be implemented and monitored successfully.

**Recommendations.**

i. E-mail facilities should be provided to Medical Officer of Health Offices in high risk areas and catchment hospitals where this facility is not available.

ii. A suitable software should be developed and installed to share patient information in a timely manner from hospitals to Medical Officers of Health, Regional Epidemiologist, Regional Malaria Officer / Regional Medical officer/ Filariasis, Epidemiology Unit and National Dengue Control Unit.

iii. Dengue notification system should be strengthened by conducting refresher training on Infection Control for Nurses and Supervising Public Health Inspectors.

**Provincial Director of Health Service Response**

"From 2004 to 2001 the data was taken from regional Director to the provincial Director by telephone once a week and it was upgraded to use e-mail notification from 2012 onwards. Though some hospitals and MOH offices use e-mail, etc, we have not yet completely deviated from the existing system of notification through post."

**Ministry of Health Response**

"Computers and dongles were purchased and distributed to infection control nursing officers(ICNO) in hospitals and some MOH. ICNO are sending daily emails to RE,RMO/MO,AFC and relevant MOH whenever a case admitted to hospitals for immediate control activities with copies to Epidemiology unit and NDCU routing weekly record of communicable diseases (H 399) is send by all MOH in the country by post to Epidemiology unit in addition to sending email report."

Recommendation II

"Development of software to share information has already been completed. This has been installed and functioning at 45 sentinel sites."

Recommendation III

"Training programs to strengthen dengue notifications and surveillance activities is a part of the routine training & capacity building activities at the Epidemiology Unit. They are conducted regularly for Regional Epidemiologists, medical officers of public health, new intern trainees, infection control nursing officers and district and divisional public health staff."

### 3.4.2 Responsibility of the Private Hospitals

Some of Private Hospitals do not communicate the information about the dengue patients in their hospitals to the relevant Medical Officer of Health Offices.

**Implication**

This attitude had adversely affected to the control action taken by the Public Health Inspector and Medical Officers of Health. Lack of notification was causing to weaken the Disease Surveillance System and as such it will not be possible to achieve the objectives of the Dengue Control Programme.

**Recommendations.**

i. All Private Hospitals should be notified that prompt reporting of the information about dengue patients to the relevant Medical Officer of Health Offices in timely manner is compulsory. This is very important for success the Disease Surveillance System and to implement effective control activities.

ii. The Ministry should issue a notification on compulsory prompt reporting of dengue cases all private hospitals .

**Ministry of Health Response**

"Through the Quarantine & prevention Act of the Government of Sri Lanka, all treating doctors are legally bound to notify the communicable diseases to the relevant MOH. Regular communications regarding the notifiable diseases are sent and updated to both public and private health institutions. All doctors (including private hospitals) are governed by the same Act. "

### 3.4.3 Epidemic Notifications

Although, Epidemic Notifications received by the Medical Officer of Health Offices should be sent to the relevant Public Health Inspector in timely manner. Kolonnawa Medical Officer of Health office had not distributed their epidemic notifications of previous months to the relevant Public Health Inspector up to the date of audit. There were thirty five (35) notifications in the file without being sent to the relevant Public Health Inspector. They had not taken action on epidemic notifications in the previous months.

**Implication**

Lack of timely action for dengue notifications results in weakening the Disease Surveillance System. As a result, dengue control activities cannot be implemented successfully.

**Recommendation.**

Immediate action should be taken to transmit Dengue Notifications to the relevant officers immediately on receipt. All the Medical Officers of Health should ensure that such action is taken.

**Ministry of Health Response**

Explanation was not given.

### 3.4.4 Inspection of the Environment around the Residences of Dengue Patients,

According to the instructions given to Public Health Inspector , they should inspect the environment around the notified residences of dengue patients, and should check at least 10 houses around the patient's house and examine whether there is any dengue vector breeding sites. But, currently the Public Health Inspector do not comply with that requirement. According to the health format; (No. 411), it was observed in audit that they only check one or two premises around the patient's house.

**Implication**

Due to non-inspection of breeding places around the patient's house, the exact areas of spreading of dengue had not been identified.

**Recommendation**

Medical Officers of Health should ensure that an adequate number of premises around the every patient's house are inspected and take appropriate action where necessary.

**Ministry of Health Response**

Explanation was not given

### 3.5. Case Fatality Rate

Dengue Fever has become a major public health problem in Sri Lanka in recent years. The number of deaths due to dengue shows an upward trend despite the Case Fatality Rate remaining below 1 per cent according to the World Health Organization guidelines, probably due to the high case load used as the denominator. According to the Action Plan of the Ministry of Health, the expected Case Fatality Rate should be below 1 percent in the years 2010 and 2011, but the actual situation in Western Province had been as follows.

| Years | Number of Cases | Number of Deaths | Case Fatality Rate ( percentage ) |
|---|---|---|---|
| 2009 | 11010 | 117 | 1.1 |
| 2010 | 11711 | 107 | 1.0 |
| 2011 | 15731 | 125 | 0.8 |

(Source of Data: Epidemiology Unit)

**Provincial Director of Health Service Response** For 3.5 (Case Fatality Rate)

"It was stated that the Case Fatality Rate should below 1 percent in the years 2010 and 2011 and WP shows as 1 percent and 0.8 percent as above."

But according to the data available in the Provincial Director of Health Services of the Western Province above table should be amended as follows and also shows less than 1 percent of the Case Fatality Rate.

| Years | Number of Cases | Number of Deaths | Case Fatality Rate (percentage ) |
|---|---|---|---|
| 2009 | 9028 | 99 | 1.9 |
| 2010 | 9617 | 79 | 0.8 |
| 2011 | 12237 | 82 | 0.6 |

### 3.5.1 Handbook for Clinically Management Guidelines

The number of deaths due to dengue shows an upward trend despite the Case Fatality Rate remaining under one per cent probably due to the high case load used as the denominator. Therefore, thorough an evaluation of the clinical management could reduce the Case Fatality Rate further. National Guidelines of Clinical Management shall be useful in the management of Dengue patients at the primary, secondary and tertiary curative levels. The Medical Officers and the rest of the staff should be regularly updated on management according to the National Guidelines.

The World Health Organization had granted funds to train 6 participants who are members of the National Expert Committee on Clinical Management of dengue and currently working in dengue epidemic areas. The following observations are made in this regard.

**a. The training programme was held in Thailand and World Health Organization recommended six participants including preferably physicians and pediatricians. But only two members of the Expert Committee had participated at the training programme.**

**Implications**

i. Failures to implement World Health Organization requirement.

ii. The opportunity has not been utilized maximally on training of dengue management for national level experts.

**Recommendations**

i. Training of professionals on proper guidelines in order to reach the targets and strengthening case management according to the new guidelines.

ii. Most suitable officers should be selected for this purpose and such opportunities should be used effectively.

**Ministry of Health Response** For Recommendation(a)i**)**

"Training programs to increase the awareness on Guidelines were conducted regularly and the details of such programs are given in the following table."

| **Year** | **Number of Trainings** | **Participants(Approximately)** |
|---|---|---|
| 2011 | Total of 55 programs have been conducted. 7 of which were conducted by foreign experts. | 3000participants.(Including Consultants, Primary and Secondary care doctors, Matrons, ICNOs,Nursing Officers PHIs) |
| 2012 | Total of 33 programs have been conducted. One was conducted by foreign experts. | 2000 Participants.(Including Consultants, Registrars, Primary and Secondary care doctors, SHOs, HOS, Matrons,ICNOs, and Nursing Officers.) " |

**Ministry of Health Response (**For Recommendation(a)ii**)**

"All the participants of the above Thailand training programme were members of the expert committee, which was appointed to develop the National Guidelines in 2010. However their individual engagement in regular training is based on number of factors including their workload in respective station. "

**b. Revise and Reprint 2000 Copies of Guidelines on Clinical Management of Dengue Fever / Dengue Haemorrhagic Fever .**

**Implication**

The Guidelines have not been distributed according to a proper system to ensure each officer deployed in the activity is provided with a copy.

**Recommendations**

i. National Guidelines should be made available for case management to all care providers.

ii. Monitor the application of Guidelines and Conduct Clinical Audits to identify and rectify the deficiencies.

iii. Guidelines should be made available for early diagnosis and treatment.

iv. The use and proper application of the Guidelines should be monitored.

v. Impact of the training and use of Guidelines has to be monitored by regular planned audits.

**Ministry of Health Response**

"3,297 copies of Adult Guidelines and 3186 copies of Pediatric Guidelines have been distributed among Ministry of Health Professionals, Medical Faculties , Professional Colleges and others."

## 3.6 High Dependency Units.

In order to further strengthen inward patient-care, the National Experts Committee on Clinical Management of Dengue Fever / Dengue Haemorrhagic Fever had proposed the establishment of High Dependency Unit under clinical consultants in selected hospitals. The High Dependency Unit is expected to help in the proper management of severe dengue patients through close monitoring process during critical phase of the illness. Estimated cost per one High Dependency Unit is Rs. 5 million.

### 3.6.1 High Dependency Unit in Homagama

A sum of Rs.6,363,857 had been spent for purchasing equipment for two High Dependency Units in Homagama Base Hospital. But it was observed that no High Dependency Unit had been established in this hospital up to 30 August 2011. All the equipment had been supplied to the hospital and some of them were issued to other wards in the hospital and others were remaining in the stores. Main objective of the Project is to provide health facilities for Dengue patients in areas where most of the complicated cases have been reported. However, the objective had not been achieved due to the failure to establishment a High Dependency Unit .

**Implication**

High Dependency Units were not established in Homagama Hospital. Therefore dengue case management procedures had not been effectively implemented. As a result of poor case management, Dengue Death Rate (Case Fatality Rate) could increase.

**Recommendation**

To reduce Case Fatality Rate below 1 percent the case management should be improved according to the Annual Action Plan for Health Master Plan Project of the Ministry of Health.

**Provincial Director of Health Service Response**

"Though a separate High Dependency Unit has not been established, a specific area/beds was set up for dengue patients in the relevant wards, and these equipment were utilized to the maximum. "

### 3.6.2 Side Rail Beds

According to the technical specifications, it has been recommended to purchase Side Rail beds at the cost of Rs. 1680 per bed. According to the physical verification done by the audit in the Base Hospital at Gampaha (21 September 2011), it was observed that pediatric beds had been used without side rails and 10 pediatric beds remained in the stores without being used.

**Implication**

Beds purchased contrary to specification recommended could be a threat to the safety of seriously ill patients.

**Recommendation**

Specifications of the beds should be decided and purchase accordingly and ensure optimum utilization.

**Provincial Director of Health Service Response**

Explanation was not given.

### 3.6.3 Oxygen Regulators

The Technical Evaluation Committee noted that there had been regular complaints on the oxygen regulators supplied to hospitals. The samples of the two offers obtained had been checked and one offer of a private company had been recommended. The bidder agreed to provide stands for oxygen cylinders free of charge, But the authorities had not selected that bidder . According to physical verification done at the Base Hospital in Gampaha, it was noted that several oxygen cylinders in the stores were not properly working.

**Implication**

Oxygen regulators are very important items for the supply of oxygen to patients who are in critical condition. In the absence of suitable regulators, patients' lives will face grave dangers.

**Recommendation**

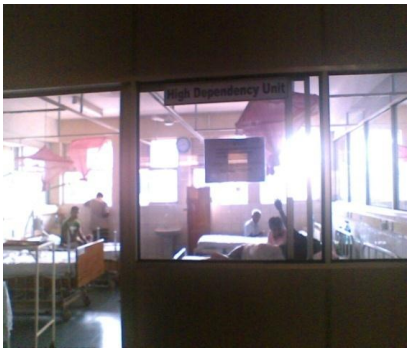
According to the Procurement Guidelines of 2006, maximizing economy, timeliness and quality in procurement resulting in least cost together with the high quality and transparency and consistency in the evaluation and selection procedure should be ensured.

**Provincial Director of Health Service Response**

This is a common problem.

### 3.6.4 Facilities for High Dependency Unit in Gampaha Hospital

Air-condition facilities had not been provided for the High Dependency Unit in the Pediatric Ward of the Gampaha Hospital as there was no provision of Air-condition facilities in specification statement. However, air condition facilities for that High Dependency Unit had been provided by an outside party as a donation by considering the necessity of that facility.



**Implication**

i. Without air-conditioning the durability of the high cost machines may be impaired.
ii. If dengue patients had not been separated from other patients it would seriously affect to the controls needed .

**Recommendation**

The air-condition facilities should be provided for every High Dependency Unit in the hospitals.

**Agency Response**

Explanation was not given.

## 3.7 Social Mobilization/Inter-sectoral Coordination.

Inter- sectoral Coordination and Social Mobilization for prevention and control Dengue Fever / Dengue Haemorrhagic Fever is a major objective of Dengue Control Unit. Action Plans for the years 2010 and 2011 of Dengue Control Unit had been prepared according to the global strategy for prevention and treatment. In order to implement the Action Plans, fulfilling Inter- Sectoral Coordination and Social Mobilization, the following major activities should be carried out.

i. Declaration of dengue weeks and media seminars.

ii. Revising and reprinting of Volunteer Handbook.

iii. Advertising Campaign on elimination of breeding places through leading electronic and print media.

iv. Conducting National Level Stakeholder meetings.

v. Training of Teachers in high risk districts on environment management.

vi. Training of Environmental Officers in high risk districts on dengue control.

vii. Production of Information Education Communication Material.

viii. Printing and use of school and home inspection cards.

ix. Evaluation and implementation of Communication for Behavioral Impact Plan for effective Dengue Control in highly epidemic districts and in other districts.

### 3.7.1 Action Plan in the Dengue Control Unit

Specific targets , time periods as well as the officer responsible for each activity should be mentioned in the Action Plan, but those details have not been included in the Action Plan of Dengue Control Unit . Although the post of specific officer should be mentioned with the responsibility, only the name of institution had been mentioned.

**Implication**

Delays of the activities had been observed due to unavailability of specific targets, time periods and officer responsible.

**Recommendation**

Specific targets, time periods and officer responsible for each activity should be stated clearly in the Action Plans.

**Ministry of Health Response**

"Name of specific officer was not written in the NDCU action plans as it is a collective activity of officers in a particular institution, therefore the name of the institution was written in action plans instead of the name of one officer with the stipulated time period for the completion of the task."

### 3.7.2 Ineffectiveness of Volunteer participation for Vector Control Activities

Strong teams of volunteers had not been deployed during the last three years. Even though several Local Authorities had deployed smaller teams of volunteers ,those had not been successful as the participating volunteers had not been guided according to a specific procedure as well as due to the insignificant allowance of Rs.200 per day paid to them.

**Implication**

The vector control programme had not been implemented effectively.

**Recommendation**

Volunteers should be paid an adequate allowance and a rewarding programme should be implemented for the motivation of active volunteers. Certificates should be issued for the participation in Volunteer programmes. Specific guidelines should be introduced for the efficient conduct of the volunteer programmes.

**Ministry of Health Response**

"With the experiences of previous years the vector control activities using volunteers were not very successful and sustainable instead to the high expenses incurred for this

activity. It was not possible to find volunteers in some areas and their retainability is also an issue. Proper monitoring of volunteer work at village level is necessary to achieve expected targets."

### 3.7.3 Programmes conducted during Dengue Peaks

Dengue weeks had been declared during dengue peaks and clean-up programmes, house inspections, and awareness programmes had been limited to that period only.

**Implication**

Normally dengue mosquitoes activate soon after every rainy period. Hence the outbreaks could recur after main two monsoons in Sri Lanka. Therefore declaration of dengue weeks during dengue peaks is not effective. As such the seven day programmes are not enough for the effective control of outbreaks.

**Recommendation**

Dengue Programme should be implemented systematically throughout the year and it should be intensified during dengue out breaks. A responsible officer in each Medical Officer of Health office also should be assigned permanently to ensure regular implementation of the programmes.

**Ministry of Health Response - (**For Implication)

"Declaration of dengue weeks and media seminars were conducted as planned in every year before the South west monsoonal rains and North East monsoonal rains. In addition to these preplanned ones, dengue weeks were declared in between whenever number of cases was rising.

Declaring dengue weeks soon after monsoon maybe too late for removing breeding places and potential breeding sites as life cycle of dengue mosquitoes is as short as a week (Egg to adult).

Declaration of dengue months instead of dengue weeks is not practicable as the prevention and control of dengue is not the sole duty of public health staff. Further, if dengue month is declared the interest and acceleration of relevant organizations and the community will reduce compared to dengue week."

### 3.7.4 Advertising Campaigns

Advertising campaigns to make the public aware of the dangers of dengue had been implemented in the year 2011. Although one million rupees had been paid by Health Education Bureau on 11 March 2011 as an advance payment for this purpose, the advertisements had been published in November to January 2012 only.

**Implication**

The advertising campaign limited to a short period is insufficient for making behavioral changes of the Public for prevention of dengue.

**Recommendation**

Advertising campaigns should be conducted throughout the year. The advertisements should be strong for making behavioral changes of the Public for prevention of dengue. Such campaigns should be followed up with physical inspections to make awareness programmers more effective.

**Ministry of Health Response**

"Advertisement campaign was handled by the Health Education Bureau and the funds were provided from NDCU. "

"Broadcasting and telecasting of advertisement cost huge amount of money for air time even in government channels. Therefore advertisements are limited to peak periods only. It is not possible to conduct advertisements throughout the year as the cost will not be able to afford by the Health Ministry. "

"National Dengue Control Unit funds were allocated for the media campaign. The activity was delegated to the Health Education Bureau. One million rupees was utilized as an advance for the development of the TV and Radio advertisements. Subsequently the total allocation was made available and the production of the advertisements was completed and they were telecasted in November 2011 to January 2012. The period was limited due to insufficiency of available funds to purchase telecasting and airing time. "

"Funds for dengue prevention media campaigns should be increased significantly for the campaigns to run throughout the year. "

### 3.7.5 Stakeholder Meetings

According to Circular No.511/81/2010 dated 01 September 2010, issued by the Secretary to the Ministry of Health the review of district level dengue situation had not been carried out once a week during the dengue peak and the progress of the decisions taken at the previous meetings and preventive measures had not been discussed at the next meeting. Details of such reviews held in Colombo, Gampaha and Kalutara districts were as follows.

| | Colombo | | Gampaha | | Kalutara | |
|---|---|---|---|---|---|---|
| | --- | | --- | | --- | |
| Years | **2010** | **2011** | **2010** | **2011** | **2010** | **2011** |
| Epidemic | 2 | 2 | - | 09 | - | - |
| Non-Epidemic | - | 3 | - | - | - | 02 |

Source :- Stakeholder Meeting Minutes

The matters discussed at these meetings have not been communicated for the information of those engaged in the programme.

**Implication**

Inter-sectoral coordination had been carried out without holding continuous national level stakeholder meetings. The decisions taken by the meetings have not been communicated to the lower levels of health service. As such the stakeholder meetings have not been properly made use of.

**Recommendation**

National level stakeholder meetings should be held and review them continuously. The progress of the decisions taken at previous meeting should be discussed at the next meetings in addition to discussing the current situation. The progress of all dengue preventive activities should be discussed at the meetings and the decisions taken at the meetings should be communicated to other relevant staff.

**Ministry of Health Response**

"National level stakeholder meetings were conducted in regular intervals (weekly/biweekly/monthly) when dengue fever cases were rising and the decisions taken during the previous meeting were discussed in the next meetings."

### 3.7.6 Training of Environmental Officers

Training of Environmental Officers in high dengue risk districts had not been conducted and the training of teachers in high risk districts on environment management had been planned to hold in the year 2010 , but the training had been held in July 2011.

**Implication**

Objectives of those programmes have not been achieved.

**Recommendations**

i. Training programmes should be organized targeting the general public including teachers and students.

ii. Training programme should be targeted on cleaning staff in Local Authorities as those staffs are working at the ground level of this function.

iii. Programmes should be organized well and conducted regularly.

iv. Strengthen training programme for Environmental Officers .

**Ministry of Health Response**

"A strategy identified to train Environment Officers and school teachers through the WHO funds. Funds were released for this activity bi-annually from the WHO At the moment all environmental officers were trained on dengue control and prevention except few newly recruited Environmental officers, therefore these funds were used to provide in-service training for Public Health Inspectors to update their knowledge after reprogramming the activity.

WHO biennium plan for 2010/2011 was prepared in last quarter of the 2009 and training programmes were scheduled for 2010. But due to the delayed approval to the plans though it was not possible to conduct training programmes as scheduled, it was completed within the biennium. "

### 3.7.7 Distribution of Information Education Communication Materials

Sums of Rs.5,395,000, Rs.6,368,500 and Rs.2,321,600 had been spent for Information Education Communication materials in the years 2009, 2010 and 2011 respectively. As observed in the audit on 22 November 2011 a large stock of Information Education Communication materials had been kept in the stores of National Dengue Control Unit and Medical Officers of Health. Residents of Lake Crescent Housing Scheme in Dehiwala interviewed stated that they had not received any of the leaflets and handouts.

**Implication**

Although a considerable amount of money had been spent for Information Education Communication materials, the leaflets had not been received by the relevant parties.

**Recommendation**

A proper distribution mechanism and a recording system should be implemented and remaining stock should be distributed among the relevant parties as soon as possible.

**Ministry of Health Response**

"A register is maintained at NDCU for distribution of IEC materials. A stock of IEC material stored in NDCU due to following reasons;

- Adequate number of IEC materials produced for distribution to Civil Security Committees following the massive outbreak in 2009.
- Buffer stock of IEC materials needs to be maintained at national level to distribute whenever necessary. "

### 3.7.8 Inspection Cards

A large stock of School and Home Inspection Cards remained in the National Dengue Control Unit and Medical Officer of Health Offices as at January 2012 . Although these cards should be inspected by Health Officers, it was observed that those were not inspected properly. A proper recording system of distribution of Information Education Communication materials and supervision had not been carried out by National Dengue Control Unit and Medical Officer of Health.

**Implication**

Proper distribution mechanism of Inspection Cards to the relevant parties and the proper feedback procedures were not available, and as such the objectives of this programmes were not achieved.

**Recommendations**

i. Remaining stock of Inspection Cards should be distributed to relevant parties as soon as possible.
ii. Proper recording system of distribution of Inspection Cards should be implemented.
iii. The School Inspection Cards should be distributed among the schools in which these projects were implemented.
iv. Inspection Cards should be inspected on timely manner by responsible officers.

**Ministry of Health Response**

"Inspection cards were printed to distribute to community through school children and they were received to NDCU on following dates.

2011.02.21 – Sinhala 400,000

2011.02.18 _ Sinhala 350,000

2011.05.30 _ Sinhala 400,000

2011.05.30 _ Tamil 300,000

Cards were issued according to the requests made by the districts and the distribution list maintained at the NDCU."

### 3.7.9 Workshops for Communication Plan for Behavioral Impact

Workshops for Communication for Behavioral Impact Plan had not been followed satisfactorily as planned by World Health Organization. District and Medical Officer of Health level communication plans also had not been prepared as expected.

**Implication**

Communication for behavioral impact is not at a satisfactory level in many districts due to unavailability of specific communication plans.

**Recommendations**

i. Overall District Communication Plan should be prepared by Health Education Bureau.

ii. Communication Plan should be prepared by each Medical Officer of Health according to the Overall District Plan.

iii. The progress of the Medical Officer of Health Level Communication for Behavioral Impact Plans should be reviewed monthly by Regional Director of Health Services and at the same time, the progress of District Level Communication for Behavioral Impact Plans should be reviewed by Provincial Director of Health Service quarterly.

**Ministry of Health Response**

"Funds were provided to HEB to conduct workshops to prepare District Outbreak Communication Plans. Those workshops were conducted by the HEB. COMBI is one of the component of Outbreak Communication Plan.

Health Education Bureau has carried out Behavioral Change Communication (BCC) program. Training of provincial and district staff for development of local BCC plans has

been successfully conducted by the Health Education Bureau. Provincial and district health authorities are the responsible implementation agency.

It will be appropriate for WHO to share successful COMBI programs from other countries with Sri Lanka. "

### 3.8. Researches on Prevention of Dengue

Researches will provide evidence to achieve the aims of reducing mobility and mortality through implementing activities. The National Dengue Control Unit has developed the draft National Strategic Plan (2008-2015) in which six control strategies were identified. Research on dengue was the last control strategy of this plan. Researches or results were not made available for audit in the Websites of the National Dengue Control Unit, Epidemiology Unit and other Dengue Control Units .

**Implications.**

i. Research priorities had not been identified.

ii. Existing Tools and Strategies had not been improved.

iii. Unavailability of researches for relevant parties.

**Recommendations .**

i. Dengue Research Collaborating Centers should be established to facilitate research in order to identify research needs.

ii. Ensure application of research findings into practice.

iii. Establish research networks within the country.

**Ministry of Health Response**

"Research component is one of the activity identified under the strategic plan and the items listed under the recommendations in this para is activities identified by the committee prepared the research component of the strategic plan which need to be implemented in the future. "

### 3.9. Legal Enforcement against Mosquito Breeding Places

Public health is the primary responsibility of all Local Authorities and is dealt with under the Municipal Councils Ordinance and Urban Councils Ordinance and the Pradeshiya Sabhas Act. All public health personnel engaged in dengue vector control serving in the Ministry of Health or in the Local Authorities should control the possible emergence of vector resistance. The following observations are made, in this regard.

### 3.9.1 Enforcement of new Act

The Prevention of Mosquito Breeding Act, No 11 of 2007 could not be effectively enforced for prohibition against creating conditions favorable to the breeding of mosquitoes due to deficiencies of the Act. Therefore Medical Officer of Health and Public Health Inspectors were implementing the regulations under the Quarantine and Prevention of Disease Ordinance of 1897 which was enacted in the Colonial period.

**Implication**

Non-implementation of the new Act is a major obstacle to effective control of creating conditions favorable to the breeding of mosquitoes.

**Recommendations**

i. Legal enforcement against offenders who are keeping mosquito breeding places need to be strengthened.

ii. The structural situation of the entities should be strengthened to facilitate enforcement of the new Act for eradication of places of mosquito breeding more effectively, by early amendment of the Act.

**Ministry of Health Response ; (**For 3.10**)**

"The prevention of mosquito breeding Act no 11 of 2007 was prepared to empower MOH and PHI in enforcement of law against the offenders which was deficient in the quarantine and prevention of disease ordinance.

However there are some practical issues due to some deficiencies in the new act, which has been discussed in details with the relevant authorities to make some amendments to the act (such as obtaining written consent from the owner of the house to enter the premises, giving unduly long 2 weeks' time period to remove the breeding place allowing time for the mosquito to complete its life cycle) etc.

There are many cases field under the new act in most of the MOH areas in the country during last few years. "

**Provincial Director of Health Service Response;(**For. 3.10.1**)**

"According to the Statue of Preventing Public Nuisances, No 03 of 2012 which was gazette on 16th August 2012 MOH & PHIs were empowered to implement regulations under it. There are many cases filed under this act."

### 3.9.2 Power to file Cases against Offenders

Ministry of Local Government and Provincial Councils has very clear mandatory responsibility for the subject of eradicating mosquitoes spreading dengue. However some Local Authorities had not been given the power to file cases against the offenders who are keeping mosquito breeding places according to the Quarantine and Prevention of Diseases Ordinance of 1897 up to 16 August 2012.

For examples, Local Authorities had not been given the power to file cases to some Public Health Inspector offices. But the following Public Health Inspector offices had received the power from Local Authorities to file cases. The details were as follows.

| **Medical Officer of Health Office** | **Number of Cases filed during the year** | |
|---|---|---|
| | **2010** | **2011** |
| i. Homagama | - | 83 ( August) |
| ii. Kaduwela | 33 | 2 (September) |
| Iii. Boralesgamuwa | - | 22 ( September) |

**Implication**

Due to lack of power to file cases, the main objective was not fulfilled.

**Recommendation**

Ministy of Local Government and Provincial Councils should give the power to file cases against the offenders who are keeping mosquito breeding places.

**Agency Response**

Explanation was not given.

### 3.9.3. Guidelines for use of Pesticides and Insecticides by World Health Organization Pesticides Evaluation Scheme

The World Health Organization Pesticide Evaluation Scheme was set up in 1960. World Health Organization Pesticides Evaluation Scheme promotes and coordinates the testing and evaluation of pesticides for public health. It functions through the participation of representatives of government, manufacturers of pesticides and pesticide application equipment, World Health Organization Collaborating Centers and research institutions, as well as other World Health Organization programmes.

In its present form, World Health Organization Pesticides Evaluation Scheme comprises a four phased evaluation and testing programme, studying the safety, efficacy and operational acceptability of public health pesticides and developing specifications for quality control and international trade.

The following observations were made in this regard.

a. Guidelines developed by World Health Organization Pesticides Evaluation Scheme for laboratory and field testing of mosquito larvicides such as foreign Bacillus thuringiensis israelensis and local Bacillus thuringiensis israelensis had not been followed by relevant authorities.

**Implication**

Impurities formed during manufacturing of the pesticide or by interaction in unstable formulations can increase product toxicity to humans and the environment. Applying products that are lower in active ingredient content than declared could result in monetary loss and application of a sub-lethal dose of pesticides leading to ineffective control and promotion of the development of resistance to pesticide

**Recommendation**

Guidelines developed by World Health Organization Pesticides Evaluation Scheme for use of pesticides and insecticides should be followed.

**Ministry of Health Response**

"Vector management is vested mainly with Anti Malaria campaign and purchasing of insecticides done in AMC directorate using NDCU funds."

b. Guidelines developed by WHO Pesticides Evaluation Scheme for efficacy testing of insecticides for indoor and outdoor ground-applied space spray applications had not been followed by relevant authorities.

**Implication**

Fogging for vector control had been found to have numerous side effects and health risk. Insecticides often damage other creatures such as butterflies, dragonflies and worms (Reference;Environmental and Health effects of Insecticide – How.com.http//www.ehow.com/list6076923) due to the absence of following World Health Organization Guidelines.

**Recommendation**

Guidelines developed by World Health Organization Pesticides Evaluation Scheme for efficacy testing of insecticides for indoor and outdoor ground-applied and space spray applications should be strictly followed.

**Agency Response**

Explanation not given

### 3.10 Other Observations

#### 3.10.1 Dengue Control Unit

Dengue Control Unit had been established to minimize the health, economic and social impact of the disease by reversing the rising trend of dengue to enhance the capacity at the national, provincial, district and divisional levels for health planning, prediction and early detection, prompt control and containment of out breaks and epidemics through partnerships application of coordinated efforts in sustainable manner.

But it was observed that adequate staff and other facilities had not been provided to achieve the above objectives of Dengue Control Unit.

**Implication**

Maximum contribution for control of dengue have not been received from Dengue Control Unit, even though an epidemic situation of dengue is prevailing in a number of provinces in Sri Lanka.

**Recommendation**

Recruit necessary staff and provide other resources such as Information Technology facilities ,and adequate office accommodation.

**Agency Response**

Explanation not given.

### 3.10.2 Strategic Plan

According to the information made available to audit, the Strategic Plan had been prepared but it had not been approved in order to achieve the objectives by the responsible officers to carry out their activities in order to achieve the objectives. Dengue control activities were operated without an approved Strategic Plan.

**Implication**

Delayed approval of strategic plan directly affected the effectiveness and efficiency of Dengue Control activities.

**Recommendation**

The Strategic Plan should be developed and approved to identify user problems earlier and act immediately to resolve them.

**Ministry of Health Response**

"Strategic Plan for Sri Lanka has been adopted from the Regional Strategic Plan developed by WHO for 2008-2015. The annual action plans (national and district level) have been prepared according to the activities and strategies in strategic plan. Strategic plan document has been finalized."

At the end of the each district level programme participants prepare their own plan. We instructed them to implement all these plans at MOH level . Implementation of plans at MOH level /District level is beyond our control. We planned to hold review meetings at district level but failed to do so due to various factors. "

## 4 Conclusion

An attempt was made to describe and evaluate performance of Dengue Control Programmes including prevention and treatment. The investigation covered three aspects such as disease surveillance of dengue fever, vector mobilizations, and ensuring accurate implementation of dengue control activities. General implication of the findings suggested that the current strategies of dengue control activities need to be reviewed for further significant improvements for the purpose of higher performance.

The disease has attracted considerable media attention and received adverse publicity in recent years. Besides causing ill-health and high mortality, it has also affected socioeconomic development due to loss of man days and productivity to the country.

National programmes are needed for implementation of an effective public health policy in development projects in urban and rural areas. Currently the national programmes have allocated meager resources on dengue control and a major part of the expense is incurred on insecticide sprays and chemical larviciding, which have had little impact on controlling the epidemic. In contrast, evidence shows that vector control through larval monitoring, source reduction and personal protection, combined with the good sanitary environment in households and communities has proven to be effective in preventing dengue.

Community participation and social mobilization for behavior modification have begun to show good results in many different settings. Investing in this approach and in integrated vector management will produce the desired results.

Dengue prevention and control should be the primary concern of the general public and the Public Health Sector. The role of national policies is to strengthen the response to dengue within the Health Sector, facilitate intra-programme collaboration and effectively mobilize inter-sectoral collaboration.

The strategies should aimed at utilizing optimally the currently available interventions based on evidence and, at the same time, advocating for intensification of research in the development of a suitable vaccine, antivirus drugs and appropriate diagnostics for dengue.

It is hoped that these strategies will be important for controlling dengue and they will be in a position to identify the strengths and weaknesses of the current issues and take action to improve the system to achieve optimum results.

The following recommendations may be useful for those who are interested in understanding the dengue control activities in Sri Lanka.

* It is necessary to have a properly implemented National Policy and Strategic Plan for Garbage Disposal.

* Strengthen Inter - Ministerial Coordination to share responsibilities to maintain a mosquito breeding free environment in the Government and private institutions.

* Strengthen disease surveillance activities

* Provide necessary equipment and logistic facilities to vector control teams.

* Strengthen laboratory services at least in one hospital in each of the high risk Medical Officer of Health areas.

* Strengthen laboratory services at large hospitals functioning round- the- clock at least during epidemics.

* Legal enforcement against offenders who are keeping mosquito breeding places need to be strengthened.

* Need to discuss with the Urban Development Authority and the related private sector entities to make new designs for houses without roof gutters for the future constructions.

* All Heads of the Government and Private Sector institutions should be made responsible in keeping their premises clean and free of mosquito breeding places.

Effective mosquito control can be achieved through community participation in Mosquito Control Programmes. Community must assume responsibility for inspection and control in and around their houses. Unfortunately, knowledge about dengue fever does not translate into action to prevent mosquito breeding. One problem is the lack of active on going partnership between Health Agencies and communities. The emphasis for dengue prevention is needed on sustainable, community - based, integrated mosquito control, with limited reliance on insecticides.

**ANNEXE**

## Guidelines for use of Chemicals for Vector Control

### Space Spraying

Objective of space sprays; To reduce the adult female population and its longevity as quickly as possible as a supplementary measure for source reduction during outbreaks of dengue.

**Space Spray Treatments**

**Organization of the Spray Team.**

A spray team should consist of one Public Health Inspector, a Public Health Field Officer trained for space spraying and three Spray Machine Operators.

- The responsible officer (Public Health Inspector or Public Health Field Officer) of the spray unit should be present with the spray unit throughout the activity for observation and attending to any emergency.
- All persons involved in the application of space spraying must wear overalls, protective gloves, suitable respirator, ear plugs, goggles and boots.
- Filter of the respirator must be periodically changed.

**Pre-space Spraying Activities**

The steps listed below should be followed in carrying out the space spraying of a designated area.

- The maps of the area to be sprayed must be studied carefully before the spraying operation begins.
- The area covered should be at least 200 meters within the radius of the house where the dengue case was located.
- Residents should be warned before the operation so that food is covered, fires extinguished, and pets are moved out together with the occupants.
- The most essential information about the operation area is the wind direction. Spraying should always be done from downwind to upwind, i.e. going against the direction of the wind.

**Information to be given to inhabitants**

- Time of spraying, for example 0800 to 1000 hours

- All doors and windows should be opened. Dishes, food, fish tanks, and bird cages should be covered.
- Stay away from open doors and windows during spraying or temporally leave the house and/or the sprayed area until the spraying is completed.
- Children or adults should not follow the spray squad from house to house.

To ensure proper quality of spraying, following factors should be considered

**Optimum Spraying Conditions**

Spraying should be done in the early morning and late evening hours as mosquitoes are most active at these hours.

Spraying should not be done in the middle of the day. When the temperature is high as convection currents from the ground will prevent concentration of the spray close to the ground where adult mosquitoes are flying or resting, thus rendering the spray ineffective.

Spraying should be carried out in steady winds(3-13 km/hr) while it should not be carried out in strong windy conditions(>13km/hr).

In heavy rain, spraying should be stopped and the spray head of the ULV machine should be turned down to prevent water from entering the blower.

Spraying is permissible during light showers as the mosquito activity increases with the relative humidity.

**Timing of Application**

Spraying should be carried out only when the right weather conditions prevail and usually only at the prescribed time. These conditions are summarized below.

| | **Most favorable Conditions** | **Average Conditions** |
|---|---|---|
| Time | Early morning<br>(0600*-1000 hours) or<br>Late evening (1600-1800 hours) | Early to mid-morning or late afternoon,<br>Early evening |
| Wind | Steady, between<br>3-13 km/hr | 0-3 km/hr |
| Rain | No rain | Light showers |
| Temperature | Cool | Mid |

- For practical reasons spraying should be commenced at 0800 hours.

**Frequency of Application**

The commencement and frequency of spraying generally recommended is as follows.

- Spraying should be started in an area (residential houses, offices, factories, schools) as soon as possible after a suspected Dengue Fever / Dengue Haemorrhagic Fever case from that area is reported.
- At least two treatments should be carried out within each breeding cycle of the mosquitoes (seven to ten days for Aedes). Therefore, a repeat spraying should be within seven to ten days after the first spraying.

**Spraying Technique**

**Vehicle-mounted Spraying.**

- Doors and windows of houses and buildings in the area to be sprayed should be opened.
- The vehicles
- The vehicle is driven at a steady speed of 6-8 km/hr (3.3-4.5 mile/hr)along the streets. Spray production should be turned off when the vehicle is stationary.
- When possible, spraying should be carried out along streets that are at right angles to the wind direction. Spraying should commence on the downwind side of the target area and progressively move upwind.
- Where the roads are narrow, and houses are close to the roadside,

  The spray head should be pointed directly towards the back of the vehicle.

- When there are inadequate roads to cover an area by the vehicle mounted fogging machine, additional hand operated fogging machines need to be utilized to spray the inaccessible houses.
- In dead – end roads, the spraying should be done only when the vehicle is coming out of the dead-end, not while going in.
- The spray head should be pointed at a $45^{o}$ angle to the horizontal to achieve maximum throw of droplets.

**Hand Operated (Portable) Thermal Fogging**

- Thermal fogging with hand operated thermal foggers should be done from house to house. Always fogging from downwind to upwind.
- All windows and doors should be shut for half an hour after the fogging to ensure good penetration of the fog and maximum destruction of the target mosquitoes.
- In single-storey houses, fogging can be done from the front door or through an open window without having to enter every room of the house All bed room doors should be left open to allow dispersal of the fog throughout the house.
- In multi-storey buildings, fogging should be carried out from upper floors to the ground floor, and from the back of the building to the front to ensure the good visibility of the operator along his spraying path.
- When fogging outdoors, it is important to direct the fog at all possible mosquito resting sites, including hedges, covered drains , bushes, and tree-shaded areas.
- The most effective type of thermal fog for mosquito ,.control is a medium/dry fog, i.e. it should just moisten the hand when the hand is passed quickly through the fog at a distance of about 2.5-3.0 metres in front of the fog tube. Adjust the log setting so that oily deposits on the floor and furniture are reduced.

**Back Pack Aerosol Spraying with ULV Attachments**

**House Spraying Technique.**

- Stand 3-5 metres in front of the house end spray for 10 to 15 seconds, directing the nozzle towards all open doors, windows and eaves. If appropriate, turn away from the house and, standing in the same place.
- If it is not possible to stand three metres from the house and, standing in the same place, spray the surrounding vegetation for 10 to 15 seconds.
- If it is not possible to stand three metres from the house due to the closeness of house and lack of space, the spray nozzle should be directed towards house openings, narrow spaces and upwards.
- While walking from house to house, hold the nozzle upwards so that particles can drift through the area. Do not point the nozzle towards the ground. In multi-storey houses, spraying should be carried out inside the houses.
- Spray particles drift through the area and into houses to kill mosquitoes which become irritated and fly into the particles.
- The settled deposits can be residual for several days to kill mosquitoes resting inside houses and on vegetation not exposed to the rain.

- This technique permits treatment of a house with an insecticide ranging from 1 to 25 grams in one minute. The dosage depends on the discharge rate, concentration of insecticide applied, and time takes to spray the house.