



सत्यमेव जयते

Operational Guidelines for Prevention and Control of Aedes mosquitoes in Hospital settings



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Ministry of Health & Family Welfare
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Message

Over the last few decades, the diseases transmitted by *Aedes* mosquitoes including Dengue, Chikungunya and Zika have spread in country due to various factors directly or indirectly associated with vector proliferation like unplanned urbanization, construction activities, population movement, improper solid waste management and socio-ecological factors. In healthcare facilities, presence of *Aedes* mosquito breeding sites possess high risk of transmission of *Aedes* borne diseases to the doctors, staff, patients and their attendants. The residents and students staying in the hospital campus are also on the risk of getting infected. Therefore, effective control of *Aedes* mosquitoes is essential to provide high quality healthcare for patients and a safe working environment for those who work in these settings. The aim of development of this guideline is primarily to sensitize the hospital staff/administration and to help in planning for Dengue control in the existing infrastructure and construction sites inside the hospital.

The efforts of National Center for Vector Borne Diseases Control (NCVBDC) in development of this document are commendable. I am confident that this will help in preventing and controlling the breeding of *Aedes* mosquitoes in healthcare facilities which will lead in minimizing the risk of transmission of *Aedes* borne diseases in the premises. I would like to congratulate NCVBDC and look forward for implementation of the vector control measures elaborated in this document in all healthcare facilities.

(Sunil Kumar)



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Message

Control of Dengue is accorded high priority by Government of India. All States and Union Territories (except Ladakh) are endemic and outbreaks are reported from time to time from various parts of the Country. Dengue is transmitted by *Aedes* mosquitoes which is a container breeder and need fresh water stagnation in and outside human habitats including healthcare facilities. *Aedes* mosquitoes prefer to breed in construction sites and dumped solid waste where water can be accumulated. If the vector breeding occurs in hospitals, the risk of transmission of *Aedes* borne viral diseases significantly increases to the doctors, hospital staff, patients, and their attendants. The residents and students staying in the campus are also thus have risk of getting Dengue. In absence of any effective drug or vaccine, prevention of vector breeding is the main strategy for Dengue control.

In view of this, the 'Operational Guidelines for prevention and control of *Aedes* mosquitoes in hospital settings' have been developed. This document envisages on keeping hospitals *Aedes* mosquito free by elimination of vector breeding sites. It will also helpful for taking appropriate vector control measures in hospital settings including construction sites.

(Dr. Tanu Jain)



Swachh Bharat : An opportunity for Dengue and Malaria Control.
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1. Introduction

Dengue, Chikungunya, ZIKA virus and Yellow fever diseases are the most important viral diseases transmitted by *Aedes* mosquito. Dengue and Chikungunya are prevalent across the country and are major public health concerns. Recently, occurrence of ZIKA virus disease has been reported from few states. Yellow fever is not yet reported from India. Among these, dengue is the fastest-growing arboviral infection with rapidly evolving epidemiology and can be life-threatening. Almost half the world's population lives in countries where dengue is endemic.

The number of dengue cases reported to WHO increased over 8 fold over the last two decades, from 505,430 cases in 2000, to over 2.4 million in 2010, and 5.2 million in 2019. Before 1970, only 9 countries had experienced severe dengue epidemics. The disease is now endemic in more than 128 countries in the WHO regions of Africa, the Americas, the Eastern Mediterranean, South-East Asia and the Western Pacific. The Americas, South-East Asia and Western Pacific regions are the most seriously affected, with Asia representing ~70% of the global burden of disease. The first evidence of occurrence of dengue fever in India was reported during 1956 from Vellore district in Tamil Nadu. The first dengue fever outbreak occurred in Calcutta (now Kolkata, West Bengal) in 1963. Out of 36 States/UTs, 35 (except Ladakh) have reported dengue cases during last two decades. Recurring outbreaks of dengue fever have been reported from various States/UTs.

Aedes aegypti is the principal vector in country, whereas, *Ae. albopictus* plays major role in transmission in areas covered with plantations particularly in peninsular and NE states. Both the urban and rural setups are affected. The vector mosquitoes under genus *Aedes* breed mainly in manmade water containers including buckets, mud pots, discarded containers, used tyres, storm water drains etc. *Aedes* mosquito deposits eggs singly on damp surfaces just above the water line. The climatic conditions particularly temperature and rainfall play key role on the life cycle, breeding and longevity of vectors and thus transmission of the disease. Average survival of *Ae. aegypti* is 30 days and *Ae. albopictus* is about eight weeks. During the rainy season, when survival is longer, the risk of virus transmission is greater. *Aedes* is a day time feeder and can fly up to a limited distance of 400 meters. In absence of any vaccine or specific drug for dengue, vector control and active participation of the community are very significant in preventing disease transmission.

It causes nosocomial infection i.e. occurring in a patient in a hospital or another healthcare facility where the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge and also occupational infections among staff of the facility. This Guidelines for prevention and control of Dengue vectors in Hospital settings includes vector control measures in hospital settings, personal protection measures, environmental manipulation, function of vector control unit cells in major hospitals, IEC/BCC activities to be carried out by the hospital authorities and the monitoring. The guidelines will help the management of hospitals/healthcare facility in preventing and controlling the breeding of *Aedes* mosquitoes.

2. Background

Dengue virus transmission can be prevented by controlling mosquito vectors or interrupting human–vector contact. Activities to control transmission should target the vector in the habitats of its immature and adult stages. Typically, these mosquitoes do not fly far, the majority remaining within 100 metres of where they emerged. They feed almost entirely on humans, mainly during daylight hours, and both indoors and outdoors.

In the hospitals, patients come from different places, different environment and their health status is unknown, so standard precautions should be observed in all health facilities. Creating awareness on Vector Borne Diseases, ensuring access to safe healthcare in for the floating population across all healthcare facilities are needed to prevent community from Dengue. The development of guidelines for *Aedes* prevention and control in Hospital settings and their implementation has been identified as an essential and core component of NVBDCP. At the facility level, these guidelines are intended to enable hospital administrators, clinical managers, doctors, nurses and allied professionals across the country to practice and develop their own policies and standard operating procedures (SOPs) according to the existing infrastructure.

3. Potential Sources

Adult *Aedes* mosquitoes can be identified by the characteristic white and black bands on legs and abdomen commonly known as ‘Tiger mosquito’. The *Aedes* mosquitoes breed in various types of domestic/peri-domestic containers with water; rest and feed in and the vicinity of human dwellings.

3.1 Regular Potential Sources

The potential breeding sites where water may stagnate/accumulate and can act as breeding places for *Aedes* mosquitoes in the hospitals are as under:

- **Inside hospital:** Water coolers, AC ducts, flower pots/containers for ornamental plants, money plants in OPD, overhead/water tanks, other containers in wards/toilets/canteens, leakages from water supply system etc.
- **Roof:** Sun shades/parapets, Overhead water tanks, unused material including condemned furniture and other articles which may accumulate water in rainy seasons
- **Campus/compound:** Unused receptacles (Bottles, tins, buckets, drums), flower pots, leaf axils, tree holes, cement tanks, tyres, paper/ thermocol cups/plates, pet bottles etc.
- **Residential areas (Flats/Hostels):** Household water containers/coolers, water tanks, flower pots, paint tins, condensation collection pans under refrigerators, plastic sheets/containers, tyres, cement tanks etc.,(follow the guidelines for community)
- **Canteen:** Water storage containers and other discarded articles

3.2 Long Term Potential Sources

- **Construction sites within hospital campus:** Articles kept for water storage and unused articles kept in the open (follow the guidelines for construction site)
- Abandoned building, construction site or sites where works stopped for certain reasons

4. Source Reduction

The best approach for control of *Aedes* is to identify the potential breeding habitats and to eliminate the same. In situations where such habitats cannot be removed or eliminated, various vector control options as mentioned below can be adopted to prevent mosquito breeding.

4.1 Environmental manipulation

- Draining the water:** Breeding habitats such as water collection/leakages in distribution pipes, valves, sluice valves, surface boxes for fire hydrants etc. may have *Ae. aegypti* breeding, if proper measures are not taken. Therefore, proper drainage system/soak pits shall be constructed to avoid water stagnation.
- Covering water-storage containers:** The water containers like clay, ceramic and cement water jars/pots, metal drums, and smaller containers storing fresh water or rainwater should be covered with tightly fitting lids or screens.
- Cleaning flowerpots/vases:** Collection of water in the saucers placed below flowerpots need to be removed every week. Water in flower vases should be removed and discarded weekly and vases should be scrubbed and cleaned before reuse.
- Cleaning incidental water collections:** Desert (evaporation) water-coolers, condensation collection pans under refrigerators, and air conditioners should be regularly checked, water to be drained and cleaned.
- Managing construction sites and roof tops:** Periodic check of roof tops of the buildings especially during monsoon season need to be done. Articles kept in the open should either be covered or disposed of at the earliest. If any article kept in the open is having accumulation of rain water, the same need to be treated at weekly interval as per guidelines. All overhead water tanks should be tightly covered.
- Managing discarded receptacles:** Tins, bottles, buckets or any other items such as plastic cups/trays and waste material etc. should be removed and properly disposed. Household and garden utensils (buckets, bowls and watering devices) should be kept upside down to prevent accumulation of rain water. Plant waste, coconut shells etc. should be disposed of properly.
- Filling up of cavities of trees in the hospital premises:** Tree holes in the hospital premises should be filled with sand during rainy season to prevent vector breeding.

4.2 Personal Protection

Protective clothing, use of mosquito nets and repellents can be used as personal protection measures. Use of locally available liquid /lotion and cream could also be used as mosquito repellents, electric liquid vaporizers may be used to prevent mosquito bite.

. Protection from mosquito bites should be taken care in the areas of

i) Hospital settings

- a. Doors and windows need to be covered with wire mesh in fever wards to prevent entry of mosquitoes to minimize the risk of transmission
- b. Mosquito nets should be used in identified fever ward/s

ii) Personal protection in waiting areas

- a. Protective clothing: Clothing reduces the risk of mosquito bite if the clothes are sufficiently thick and loosely fitted. Long sleeves and trousers with stockings may protect the arms and legs, which are the preferred sites for mosquito bites.

4.3 Vector Control

The *Aedes* mosquito can be controlled through source reduction and recurrent anti-larval measures. Adult mosquitoes can be controlled by Space Spray/fogging of Pyrethrum and Malathion.

a. Chemical Control

Larval control: Chemical control measures (larvicide) are recommended in permanent water containers where water has to be conserved or stored for construction activity and cannot be emptied.

b. Insect growth regulators (IGR)

Insect growth regulators (IGRs) interfere with the development of the immature stages of the mosquito during the molting process in larvae or by disruption of the pupal and adult transformation process. IGRs approved under NVBDCP and details regarding formulations are available on NCVBDC website (<https://nvbdcp.gov.in>).

c. *Bacillus thuringiensis israelensis (Bti)H-14*

Bti H-14, which is commercially available under a number of trade names, is a proven and environmentally non-intrusive mosquito larvicide. The advantage of *Bti H-14* is that on application it destroys the larval stages of mosquitoes but spares other non-target species that may be present. *Bti H-14* formulations tend to rapidly settle at the bottom of water containers, and frequent applications as recommended in the guidelines are therefore required. Details of various formulation and the dosages of Bti approved under NVBDCP are available on NCVBDC website (<https://nvbdcp.gov.in>).

- d. Use of Temephos:** This is being used under the public health programme for control of *Aedes* larvae. The recommended dose for application of Temephos (50 EC) is 1 ppm (1 mg per litre of water).

4.5 Adult control: indoor space spray/fogging

Larval control has been emphasized as the most important measure for prevention and control of Dengue and Chikungunya. **However, during epidemic/out break and emergency situations, it is important to interrupt transmission at the earliest to stop further spread of disease by reducing densities of adult**

vector mosquitoes (infective mosquitoes). This can be achieved through indoor space spray and outdoor fogging. **Fogging should be avoided as it may induce uneasiness for the breathing of the patients.**

5. Monitoring

A nodal officer needs to be identified preferably from PSM Department to coordinate with the authorities on all matters related to vector control. Nodal Officer needs to:

- monitor the work being carried out by the vector control unit
- maintain data regarding disease surveillance, logistics for vector control
- organize training/refresher training to medical, para medical staff and students in coordination with local health authorities
- plan and implement IEC/BCC activities in the campus
- sought help from local health authority for vector control
- apprise the concerned officer about the situation on day to day basis particularly during the transmission season

5.1 Vector control Unit

A vector control unit needs to be established including staff involved in sanitation. Basic functions of this unit should be:

- Survey and mapping of all potential mosquito breeding sites in the campus and to list such sites
- Weekly rounds to cover all mapped sites to check the presence of vector breeding
- To ensure that all water containers inside the hospitals as well as outside are properly covered to prevent mosquito breeding
- Eliminating the breeding habitats which are found positive for mosquito breeding
- Breeding sites which cannot be removed should be treated as per the guidelines
- Other vector control measures need to be taken as and when required

5.2 Monitoring at Construction Sites

Construction sites are most preferred breeding sites for *Aedes* mosquito and it may breed in various types of containers holding water which are available in abundance in and around construction sites.

To prevent breeding of *Aedes* mosquitoes to stop transmission of *Aedes*-borne diseases at the construction site in the hospital premises so that there is no focal transmission Dengue or any other *Aedes*-borne disease.

- **Mapping of breeding habitats at the construction site** – The local health workers should visit the construction site and do a survey alongwith the construction site supervisor and the hospital nodal officer. All the probable *Aedes* breeding sites, curing tanks, etc should be noted in a register. A copy of the same should be provided to the supervisor of the construction site. In the

subsequent visits these sites should be checked and if any additional sites are created that to be included in the list.

- **Breeding sites of *Aedes* mosquito at construction sites:** The probable potential breeding sites for *Aedes* mosquito at construction sites where water could accumulate and acts as breeding places are as under:
- **Inside the under-construction building:** Sunshades/parapet, floors, Air conditioner duct, lift columns, basement, toilets, water tanks and drums/plastic containers and any other material which can hold water.
- **Over the construction building:** terrace, overhead water tanks, unused materials, empty packing boxes, which may accumulate water in rainy season
- **Unused containers:** Bottles, tins, buckets, drums, tyres, cement/plastic tanks, other water storage containers, construction material, unused materials, dumpers etc., kept in the open or inside
- **Residential areas for workers (mainly temporary shelters):** Household water containers, unused receptacles (Bottles/tins/buckets/drums/tyres), cement/plastic tanks, water storage tanks etc.
- **Temporary shops/sheds near the construction sites:** Water storage containers and other discarded articles

Roles and responsibilities of the contractor/project owner and the local health authorities with respect to vector control measures

Project owner/Contractor or person responsible for construction supervision should keep an approximate budget of project cost for undertaking work related to prevention and control of *Aedes* vector breeding. The local bodies or concerned authorities should issue directives in this regard. The vector control strategy for prevention and control should be implemented in consultation or in coordination with local health authorities as per guidelines.

Local Health authorities will make weekly/fortnightly visits of the construction sites and will guide the nodal person identified for vector control for undertaking source reduction and other vector control measures.

If the area is found to be having high potential or having breeding of *Aedes* mosquito notice will be issued to the concerned agency/authorities with an instruction to take appropriate action to prevent mosquito breeding.

If the instructions contained in the notice are not complied with and if mosquito breeding is found during the subsequent visit, penalty will be imposed on the concerned agency/authority as per the provisions in the notification/directives issued by the local body or State Government.

- Adequate number of personnel will be deployed for vector control activities at the site by utilizing the budget earmarked for this purpose. These personnel will be trained by the local health authorities for undertaking vector control activities.
- Weekly visits of all the breeding habitats will be carried out by the staff deployed, to find out breeding of vector mosquito in water holding containers. If mosquito larvae are found it should be treated with larvicide or to be destroyed/

eliminated. The containers which are not in use shall be kept upside down or removed (if not required).

- If adult mosquito is present at the site and if fever cases are reported among the labors fogging activity with pyrethrum will be undertaken.
- Monitoring at weekly interval to be ensured in coordination with the local Health authorities.
- Appropriate actions must be taken against the Contractor/ owner of the project as per the provisions contained in the directives/notifications issued by the local body or the State Government if mosquitogenic conditions are created.
- Laborers staying at the construction sites shall be provided with proper accommodation and health care. Mosquito nets shall be provided to the laborers so that they are protected from vector borne diseases.
- **Abandoned construction site or sites where works stopped for certain reasons:**

Project owner/Contractor or person responsible for construction supervision should ensure that identified Workers/Supervisors are made responsible for undertaking measures for prevention and control of *Aedes* vector breeding. The local bodies or concerned authorities should be informed about the halting the construction activities. The VBD workers of the respective locality should monitor the construction activities and apply larvicide wherever needed. In case of high vector breeding the Project owner/Contractor should be instructed for taking immediate vector control measure. If needed, legal actions shall be taken as per prevailing public health act or as per local administration.

Following details should be maintained in a register:

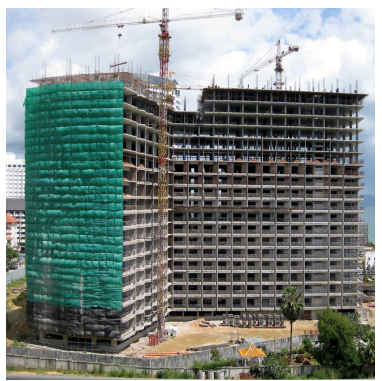
Sl. No.	Name of the Person	Age	Sex	Date of Joining the current construction	Name of the previous work spot	Date and name of the Test taken	Result

This Register should be inspected and checked by the area Health authorities regularly. The individuals should be retested whenever they go to their native place and return back to the construction site.

6. IEC/BCC activities to be carried out by the hospital authorities

- Organize training for the students and staff on prevention and control
- Hands on training for maintenance and sanitation staff regarding identification of possible mosquito breeding sites in hospital and their elimination/management
- Sensitize the patients and attendants for Do's and Don'ts during transmission season
- Display of hoardings, banners, wall writing etc in the hospital premises with appropriate messages for disease prevention
- Posters and leaflets may be displayed on the notice board in every department
- Audio-Visual spots to be shown in waiting rooms of patients
- Distribution of Handbills to the patient's attendants
- Messages to sensitize the medical, para medical staff, students and visitors for proper disposal of solid waste.

Potential breeding places in construction sites



Monitoring and preventive measures in the construction sites