GUIDELINES

FOR CONTAINMENT OF CHIKUNGUNYA AND DENGUE EPIDEMIC OUTBREAKS

1. Introduction:

Chikungunya, is caused by an arbovirus and transmitted by *Aedes aegypti* mosquito. The name, comes from the Swahili that “which bends up", reflecting the physique of a person suffering from the disease. It resembles Dengue and is reported mainly from Africa, South-East Asia including India and Pakistan. It occurs principally during the rainy season. Chikungunya outbreaks typically result in large number of cases but deaths are rarely encountered.

The human infections are acquired by the bite of infected *Ae. aegypti* mosquitoes, which are day biters and epidemics are sustained by human-mosquito-human transmission. These mosquitoes usually breed in clean water collections in containers, tanks, disposables, junk materials in domestic and peri-domestic situations.

Symptoms of infection generally last for three to seven days after the patient has been bitten by the infected mosquito. After an incubation period of 4-7 days, there is a sudden onset of flu-like symptoms including fever, chills, headache, nausea, vomiting, severe joint pain (arthralgia) and rash. Rash may appear at the outset or several days into the illness; its development often coincides with defervescence, which takes place around day 2 or day 3 of the disease. The rash is most intense on trunk and limbs and may desquamate. Migratory polyarthritis usually affects the small joints. The joints of the extremities in particular become swollen and painful to the touch. Although rare, the infection can result in meningoencephalitis (swelling of the brain), especially in newborns and those with pre-existing medical conditions. Pregnant women can pass the virus to their fetus. Haemorrhage is rare and all but a few patients recover within 3-5 days. Residual arthritis, with morning stiffness, swelling and pain on movement may persist for weeks or months after recovery. A full blown disease is most common among adults, in whom the clinical picture may be dramatic. Severe cases of chikungunya can occur in the elderly, in the very young (newborns) and in those who are immunocompromised.

Dengue fever and Chikungunya outbreaks evolve quickly, requiring emergency actions to immediately control infected mosquitoes in order to interrupt or reduce transmission and to reduce or eliminate the breeding sites of the vector mosquito, *Ae. aegypti*. In order to meet such emergencies, it is essential that persons at all levels, including individuals, the family, the community and the government, contribute to preventing the spread of the epidemic. The following emergency action may be taken to prevent or contain an incipient epidemic:

1.1 At Household level:

- *Ae. aegypti* mosquito bites during day times only. Kill adult mosquitoes by making use of commercially available safe aerosols (Pyrethroid-based). Spray bedrooms, including closets, bathrooms and kitchens (by removing/covering all food items properly) for a few seconds and close the room for 15-20 minutes. The timing of the spray should coincide with the peak biting times of the *Ae. aegypti* mosquito, e.g., early morning or late afternoon.
- Use commercially available repellants during the day time.
- Intensify efforts to reduce actual or potential larval habitats in and around houses.
- Cover water containers in the house to prevent fresh egg laying.
- Have infants sleep under bed nets during the day.
- Wear protective clothing (full sleeves shirts & full pants during day time).
- Use tight-fitting screens/wire mesh on doors and windows.
- Clogged gutters and flat roofs that may have poor drainage need to be checked regularly.
- Water in bird baths and plant pots or drip trays should be changed at least twice each week.
- Pet's water bowls need to be emptied daily.
- In ornamental water tanks/garden, larvivorous fish (e.g., Gambusia, Guppy) need to be introduced. These small fishes eat mosquito larvae.

1.2 At School level:

- School children should be provided with health education on all aspects of dengue and chikungynya fever: what it is, how it spreads, the role of mosquitoes, where & how they breed/rest, and how they can be controlled.
- School children should be trained on how to detect and eliminate the breeding of *Ae. aegypti* in and around the schools, in their homes and in the neighborhood.
- School children should be advised to wear protective clothing - full sleeves shirts & full pants during day time (during school time as well as before and after school)
- In ornamental water tanks/garden, larvivorous fish (e.g., Gambusia, Guppy) need to be introduced. These small fishes eat mosquito larvae.
- Weeds and tall grasses should be cut short; adult mosquitoes look for these shady places to rest during the hot daylight hours.
- In case, water containers can not be emptied, Temephos (1 ppm) should be applied on weekly basis.

1.3 At Community level:

- People should form groups to supplement and reinforce efforts at the household levels.
- Such group can identify commercial activities such as traders dealing in used tyres, which may be contributing larval habitats for the vector.
- They can create awareness about dengue/chikungynya and seek cooperation for the removal of breeding places. Community activities against larvae and adult mosquitoes can include:
    - Cleaning and covering water storage containers
    - Keeping the surroundings clean and improving basic sanitation measures
    - Burning mosquito coils to kill or repel the mosquitoes
    - Burning neem leaves, coconut shells and husks to repel mosquitoes and also to eliminate outdoor breeding sites
    - Screening houses, particularly bedrooms
    - Making available hand aerosols for killing mosquitoes
    - Cleaning weeds and tall grass to reduce the available outdoor resting places for adult mosquitoes near houses

- Using mosquito nets to protect infants and small children from bites during the day time and also insecticide treated nets and curtains to kill mosquitoes attempting to bite through the nets or resting on nets and curtains.

1.4 Action by local health authorities:

1.4.1 Constitution of Emergency Action Committee and Rapid Action Team

(A) <u>Emergency Action Committee (EAC)</u>

An Emergency Action Committee should be constituted under the Chairmanship of District Collector or Municipal Commissioner to co-ordinate activities aimed at emergency vector control measures and management of serious cases.

Constitution:

The EAC will comprise administrators, epidemiologists, entomologists, clinicians and laboratory specialists, school health officers, health educators and representatives of other related sectors including civil society, etc.

Functions:

(a) To take all administrative actions and coordinate activities aimed at management of serious cases in all medical care centers and undertake emergency vector control measures.

(b) To draw urgent plans of action and resource mobilization in respect of medicines, intravenous fluids, blood products, insecticides, equipment and vehicles.

(c) To liaise with intersectoral committees to mobilize resources from non-health sectors, namely Urban Development; Ministry of Education, Ministry of Information; Legal Department; Water Supply; Waste Disposal and Information for elimination of breeding potential of *Ae. aegypti*.

(d) To interact with the news media and NGOs for dissemination of information related to health education and community participation.

(B) Rapid Action Team (RAT)

Rapid Action Team should be constituted with the aim to undertake urgent epidemiological investigations and provide on the spot technical guidance required and logistic support.

Constitution:

The RAT at state/provincial levels will comprise epidemiologists, entomologists and a laboratory specialist. At local levels such as PHC/CHC, RAT may comprise Medical officer, public health officer, non-health staff, local government staff.

Functions:

- Undertake urgent epidemiological and entomological investigations.
- Provide required emergency logistical support, e.g. delivery of medical and laboratory supplies to health facilities.
- Provide on-the-spot training on case management for local health staff.
- Supervise the elimination of breeding places and application of vector control measures.
- Carry out health education activities.
- Collection of serum specimens.

2 Vector control Measures:

For control of epidemics, vector control is considered to be one of the important strategies to interrupt or reduce transmission. Adult mosquitoes can be controlled by the use of chemical insecticides. It should be emphasized, however, that rapid and effective source reduction for elimination of breeding sites of vector mosquitoes will achieve the same results. Moreover, larval control is more economical and provides sustainable control by eliminating the source of newly-emergent adult mosquitoes. Chemical space sprays are not effective in most of the conditions and it is rare that an epidemic will be controlled by using these methods. Because of their visibility, however, people think the government is doing something. This often creates a false

sense of security and prevents implementation of the community as well as individual efforts outlined above. There are two main types of space spraying for adult mosquito control as given below:

2.1 Indoor space spraying:

For indoor spraying, pyrethrum extract after dilution is sprayed with Flit pump or hand operated fogging machine fitted with micro-discharge nozzle. Commercial formulation of 2% pyrethrum extract is diluted with kerosene in the ratio one part of 2% pyrethrum extract with 19 parts of kerosene (volume/volume). Thus, one litre of 2% pyrethrum extract is diluted by kerosene into 20 litres of 0.1% pyrethrum extract 'ready-to-spray formulation'. One litre of 'ready-to-spray formulation is sufficient to cover 20 households, each household having 100 cubic metres of indoor space.

Advantages of Indoor pyrethrum space spray:

- It is non-toxic to humans and other non-target organisms at the recommended dose
- The spray equipment is simple, cheap and readily available in the market at affordable prices to the householders
- The householders can spray the diluted pyrethrum with ease in their own premises
- The vectors have not yet developed resistance to this natural product in spite of using for many decades in the programme.

2.2 Outdoor space spraying :

2.2.1 Ultra Low Volume (ULV) Spray:

In Ultra Low Volume application, minimum volume of liquid insecticide formulation is applied per unit area. This provides maximum effectiveness against target vectors. Most organo-phosphorous insecticides in their technical form can be applied as ULV spray. Under the public health programme, presently technical malathion is the insecticide used for this purpose.

The insecticide is broken down into small droplets of a volume median diameter (VMD) of 40-80 microns with an objective of producing a cloud of insecticide droplets that remain suspended in air for an appreciable time and driven under the influence of wind. Since no diluent is used, the technique is more cost-effective than thermal fogging but it does not generate a visible fog.

The ground equipment mostly used for ULV spray includes portable motorized knapsack blowers and cold aerosol generators.

Advantages of ULV spray (Cold Fog):

- Relatively less use of insecticide and minimal amount of diluent, mostly ready to use formulation reducing operator exposure
- Low fire hazard and relatively more environment-friendly
- Efficient application because of use of finer size droplets at higher density with less volume of insecticide
- Practically no visibility reduction due to ULV fog
- The cold fog is not visible like thermal fog but this is not a technical disadvantage.

2.2.2 Thermal Fogging:

The technique is based on the principle that insecticide is vapourized, which condenses to form a fine cloud of droplets on contact with cooler air when it comes out of the machine. The insecticide is vapourized at a very high temperature inside the machine. Once the fog comes out of the machine, it tends to spread in different directions by mixing with wind. The insecticide of choice for fogging is malathion/pyrethrum, because of relatively lower mammalian toxicity and being biodegradable so these do not persist in environment for longer durations. Thermal fogging is psychologically more acceptable as it generates a highly visible fog. The most common and preferred types of equipment include portable thermal fogger and mist blowers. Vehicle mounted machines have limitation as their use is restricted to areas with communicable road only.

Although thermal fogging produces denser and perceptible insecticide cloud, it is much more expensive and epidemiologically less effective than ultra low volume spray.

Advantages of thermal fog:

- The spray formulation contains lesser active ingredient of insecticide in a large volume of diluent thereby reducing operator exposure to insecticide
- Easily visible fog resulting sense of satisfaction

Though thermal fog has the advantage of being visible, the disadvantages outweigh this aspect:

- Formulation contains large volume of diluent (organic solvent), which make operation expensive due to high cost of solvent and application
- Thick fog causes reduced visibility and traffic hazards
- Burning of large volumes of diluent may not be environment-friendly
- Very high temperature of the machine operations and use of organic solvents (highly inflammable) poses serious risk of fire hazards.

2.3 Larval Control measures :

Specific activities for controlling larvae of Aedes mosquito are:

- Removal, disposal, burying or burning of all unused tins, cans, jars, bottles, tyres, coconut shells and husks and other items that can collect and hold water.
- Keeping tyres, metal boxes, discarded appliances, sinks, basins, cement tanks, pots and parts of other items in industrial and commercial premises, in sheltered areas protected from rainfall.
- Arranging clean up campaigns once or twice a year by the local health authorities or community leaders in order to collect and remove all unusual containers and potential breeding sites in and around houses.
- Turning water drums and small earthen jars upside down once a week. Emptying and cleaning procedures are easier when the water level is low.

- Periodically scrubbing the inside of water containers to destroy Aedes eggs at the time of container cleaning.
- Regularly emptying water in flower vases in houses and offices at least once a week.
- Covering large volume water storage tanks, inlets and overflow outlets with mosquito wire mesh.
- Construction of rectangular cement tanks with a plug at the bottom to allow easy draining for weekly cleaning.
- Shredding or cutting old tyres into flat pieces and disposing them in properly constructed and managed landfills away from populated areas.
- Puncturing holes in tyres used for recreational purposes by children in schools and parks.
- Draining water logged tree holes.
- Turning tin cups used to collect sap from rubber tree in rubber plantations upside down when not in use.
- Pouring boiling water into small earthen ware jars to kill larvae when the water level is low.
- Leveling or filling in the top bamboo fences to prevent the accumulation of water and breeding.
- Filtering water from one container to another through cloth in order to trap and dislodge larvae and pupae.
- Introducing larvivorous fish in water storage containers to eat mosquito larvae.
- In case, water containers can not be emptied, Temephos (1 ppm) should be applied on weekly basis.

3 Diagnosis:

Detection of antibody of haemo-agglutination inhibition and neutralization test is diagnostic, though there have been cross reaction with other viruses. The definitive diagnosis can only be made by laboratory means. But Chikungunya should be suspected when epidemic disease occurs with the characteristic triad of fever, rash and rheumatic manifestations. Viremia will be present in most patients during the first 48 hours of disease and may be detected as late as up to 4 days in some patients.

Virus-specific IgM antibodies are readily detected by capture ELISA in patients recovering from Chikungunya infection and they persist in excess of 6 months.

Haemagglutination inhibition (HI) antibodies appear with the cessation of viremia. All patients will be positive by day 5 to 7 of illness. IgM capture ELISA is necessary to distinguish the disease from dengue fever.

4 Treatment:

As with the other arbovirus diseases, there are no therapeutic drugs for management of dengue and chikungunya. However, symptoms are treated, e.g. with non-aspirin analgesics and anticonvulsants. Currently no vaccine is also available.

Supportive therapy is extremely important in Dengue, particularly preceding or during shock when the blood volume and serum electrolytes are so labile (DHF/DSS). A hematocrit run every one or two hours will indicate whether whole blood, plasma, glucose in saline or other electrolytes are needed parenterally.

Supportive care with rest is indicated in case of Chikungunya especially during the acute joint symptoms. Movement and mild exercise tend to improve stiffness and morning arthralgia, but heavy exercise may exacerbate symptoms.

5 Surveillance:

- Epidemiological and entomological surveillance needs to be intensified. Reporting of fever cases is to be monitored closely.
- Active surveillance by health workers need to use the case definition for “cases presenting with acute fever associated with Arthralgia/Arthritis (painful and stiff joints)” to detect new cases early for treatment. This will help in identifying affected areas so that control measures may be initiated.
- Vector surveillance (both adult and aquatic stages of mosquitoes) should be intensified. This will help in identifying areas for initiating control measures and assess impact.

- Medical and health institutions, professional associations, private practitioners, NGOs should be involved for fever reporting and proper case management.

6 IEC activities:

IEC activities are crucial for community sensitization and participation. People need to be educated about the disease, mode of transmission, availability of treatment and adoption of control measures. The activities have to be intensified particularly to effect changes in practice of storage of water and personal protection. They should also be reassured that this is a preventable disease. People should be encouraged to use personal protection measures in the form of full sleeved cloths, use of mosquito repellant and insecticide treated mosquito net (even while sleeping during daytime)/curtains, etc. They should be advised to cooperate during fogging and take measures for eliminating breeding places. Community ownership has to be encouraged in the long term for sustaining low larval and adult densities of mosquitoes and use of personal protection measures.

Special campaigns may be carried out with the involvement of mass media including local vernacular newspapers/magazines, radio and TV as well outdoor publicity like hoardings, miking, drum beating, rallies, etc. Health education materials should be developed and widely disseminated in the form of posters, pamphlets, handbills, hoardings. Inter-personal communication through group meetings, traditional / folk media particularly must be optimally utilized.

Involvement of NGOs, Faith Based Organizations, Community Based Organizations including Residents' Welfare Organizations, Women's Self-Help Groups and professional associations like Indian Medical Association, Nehru Yuvak Kendras, NSS/NCC units in schools and colleges in control activities should be promoted actively.