BioSpectrum the business of Bio & Health Sciences

Story of Twin Brothers - Dengue & Chikungunya

12 October 2016 | Features | By BioSpectrum Bureau

Story of Twin Brothers - Dengue & Chikungunya

Heartthrob of millions Vidya Balan is down with Dengue and the mosquito from the swimming pool of Shahid Kappor is the real culprit for it. Interesting stuff for a news story with commendable TRP. Nowadays, Dengue is in the news for one or the other reasons. Dengue & Chikungunya are twin brothers sharing one & the same vehicle for their travel. Every year shortly after beginning of monsoon showers, we experience rise in Dengue cases & it occupies coveted place in news headlines, making every other news less important. After their first appearance during 1960s, these twin brothers were almost missing. That is why their reemergence story reminds Manmohan Desai's lost & found Bollywood story in 1980s.

History of Dengue

World War II has played a vital role in expanding Dengue affected areas. Allied forces might have defeated Germany & Japan; but the real victorious was Dengue virus. Prior to World War II, dengue viruses had a global distribution in the tropics, but as urbanization was quite minimal and the viruses and mosquito vectors was dependent on ocean going vessels for transportation among regions, epidemics were sporadic & that too with long intervals between them. That is why, prior to second World War, Dengue fever was not considered a major public health problem.

During World War II, while in Asiatic region, thousands of soldiers from both the sides were affected by Dengue & Malaria. Troop movement & transport of war material has facilitated transportation of Dengue virus & its vector Aedes aegypti to most countries of both the regions.

World War II was followed by emphatic economical growth of SE Asia which was vital in the unprecedented urban growth that began in the 1950s and continues today. During this period, first documented epidemics of dengue occurred in the Philippines (1953-1954) and Thailand (1958), Singapore, Malaysia and Vietnam (1960s) and Indonesia and Myanmar(1970s).

In India, first epidemic of Dengue was reported from Chennai (Madras) in 1780. But 1964's Kolkata epidemic is the first virologically proved Dengue outbreak of Modern India.

Current Status

As per WHO, "The incidence of dengue has grown dramatically around the world in recent decades. The actual numbers of dengue cases are underreported and many cases are misclassified. One recent estimate indicates 390 million dengue infections per year, of which 96 million manifest clinically (with any severity of disease). Another study, of the prevalence of dengue, estimates that 3.9 billion people, in 128 countries, are at risk of infection with dengue viruses

In India, we are observing steady rise of Dengue cases in last decade. Last Year, National Vector Borne Diseases' Control Program (NVBDCP) reported approximately 1 Lac Dengue cases with 220 deaths in entire country. This year up to first week of September respective figures are 36 thousands cases & seventy deaths. But we have to accept these figures with a pinch of salt especially when one report estimates that India has about six million laboratory confirmed Dengue cases annually resulting in an annual economic loss of about 1.11 billion dollars.

Maharashtra being one of the most urbanized & developed states, bears maximum brunt of Dengue every year. State has reported maximum cases during 2014. In that year, state has 8500 plus cases & 144 deaths. This year till August, state has reported 2572 cases which are almost double the number as compared with last year's figure of the same period.

After 2006's epidemic, Chikungunya is again surfacing in certain areas like New Delhi & Pune. We all must be serious enough while dealing with the Dengue menace. 1996 Dengue outbreak has claimed more than four hundred lives in Delhi alone. Our complacency & short sightedness shall lead to such dire situations again & again. We should not opt for short term measures bypassing long term interventions.

Know Dengue for No Dengue

Dengue is a mosquito-borne viral disease. Dengue virus is transmitted by female mosquitoes mainly of the species Aedes aegypti and, to a lesser extent,Ae. albopictus. There are 4 distinct, but closely related, serotypes of the virus that cause dengue (DEN-1, DEN-2, DEN-3 and DEN-4). Recovery from infection by one provides lifelong immunity against that particular serotype. However, cross-immunity to the other serotypes after recovery is only partial and temporary.

Symptoms of Dengue are similar to flu. Abrupt onset of Fever, Frontal headache, retro orbital pain, muscle & joint pain, measles like rash over chest & upper limbs, Nausea & vomiting are the common signs & symptoms of Dengue. Dengue Hemorrhagic Fever (DHF) & Dengue Shock Syndrome (DSS) are the major complications of Dengue. Warning signs of severe dengue include abdominal pain or tenderness, persistent vomit¬ing, clinical fluid accumulation, mucosal bleeding, leth¬argy or restlessness, liver enlargement of >2 cm, or an increase in haematocrit concurrent with a rapid decrease in platelet count.

There is no specific treatment for Dengue. Symptomatic clinical management is the mainstay of Dengue treatment.

Why Dengue is increasing?

The very title of an article written by world known Dengue expert Duane Gubler in ' Tropical Medicine & Health' explains rise of Dengue in recent years. The title of this article published in 2011 was 'Dengue, Urbanization and Globalization: The Unholy Trinity of the 21st Century'. Rapid & unplanned urbanization, exponential population growth, inadequate municipal services, increased use of non-biodegradable products (bottles, tyres, plastic cans etc), unprecedented growth in population movement & commodity transport all have contributed to the rise of Dengue. In last 50 years, there is 30 fold rise of Dengue.

Dengue & Chikungunia - Similarities & Differences

Chikungunya is caused by the chikungunya virus. This is only single virus, there are no subtypes like Dengue virus. As natural infection gives lifelong immunity, outbreaks of Chikungunya are not as frequent as Dengue. It is observed that, Chikungunya emerges after every 10-12 years, after sufficient non-immune cohort of the population is built up. We have previous epidemic of Chikungunya in 2006. Chikungunya resembles dengue fever, and is characterized by severe, sometimes persistent, joint pain (arthiritis), as well as fever and rash. It is rarely life-threatening. Just like Dengue, there is no specific treatment for Chikungunya.

ELISA tests are considered as confirmatory by national authorities, though rampant use of various rapid diagnostic tests without any scientific validation is rule of the day. This adds to already existing chaos.

The Six Legged Enemy

To understand how to contain Dengue & chikungunya, we need to know about their vehicle in more details. Aedes aegypti also transmits Yellow Fever & Zika.

Aedes is a small, black mosquito with white stripes and is approximately 5 mm in size. It takes about 7 to 8 days to develop the virus in its body and transmit the disease. Aedes is day biter. It mainly feeds on human beings in domestic and peridomestic situations. It rests in the dark corners of the houses, on hanging objects like clothes, umbrella, etc. or under the furniture. Aedes aegypti mosquito breeds in any type of manmade containers or storage containers having even a small

quantity of water. Eggs of Aedes aegypti can live without water for more than one year. Desert coolers, Drums, Jars, Pots, Buckets, Flower vases, Plant saucers, Tanks, Cisterns, Bottles, Tins, Tyres, Roof gutters, Refrigerator drip pans, Cement blocks, Cemetery urns, Bamboo stumps, Coconut shells, Tree holes and many more places where rainwater collects or is stored are the favored breeding sites of Aedes mosquito.

This explains our responsibility as an individual & as a community in effective containment of aedes breeding. As aedes is day biter, we should be cautious enough to sanitize our working places along with our domestic environment.
Medical Entomology is the important branch of science which deals with study of vectors, its bionomics, sensitivity of vector to insecticides, assessing vector density & identification of impending outbreaks. We need to develop human resource adequately equipped with entomological expertise so as to effectively deal with various vector borne diseases.

Prevention & Control
Prevention & control activities mainly focus on regular fever surveillance, clinical management of cases & integrated vector management (IVM) to curtail mosquito breeding & avoid man- mosquito contact. Personal prophylactic methods like using bed nets, mosquito repellant in various forms is important for individual & family protection. In biological control methods larvivorous fishes are introduced in appropriate water bodies. Biocides like Bti are also used. Use of Temephos as a larvicide as well as aerosol space spray using suitable insecticide are the modes of chemical control. IVM emphasizes on environmental management & various source reduction methods. Stored water should be properly covered to avoid mosquito breeding. 'Weekly dry day', concept has been developed as an effective tool of mosquito abatement. Education of masses & community participation in all these activities are keys to success.

National Vector Borne Diseases' Control Programme (NVBDCP) deals with prevention & control of all vector borne diseases (VBDs) including Dengue & Chikungunya but without community participation, effective & long lasting control is difficult to achieve.

Dengue Vaccine- Ray of Hope
The first dengue vaccine, Dengvaxia by Sanofi Pasteur, was first registered in Mexico in December, 2015. This is a live recombinant tetravalent dengue vaccine that has been evaluated in Phase III clinical studies.

As per WHO recommendation, countries should consider introduction of the dengue vaccine only in geographic settings where epidemiological data indicate a high burden of disease. In India, apex committee found limited data to introduce this new vaccine. Experts are expecting more clinical trials & assessment of exact seroprevalence in various geographical areas to safely launch Dengue Vaccine in the country. 'Immune enhancement' is the distinguishing phenomenon found in Dengue pathogenesis. Infection by one of the four dengue virus serotypes has been shown to confer lasting protection against homotypic re-infection, but only transient protection against a secondary heterotypic infection. Secondary heterotypic infection is associated with an increased risk of severe disease. This is called as 'Immune enhancement' which is the major challenge in safe vaccine development for Dengue.

Though Dengue vaccine has arrived on the horizon, it should not be looked as panacea for our Dengue menace. There is no substitute to cleanliness and our civic sense of responsibility. We should plan & devise process of urbanization & industrial development conducive to public health. Climate change & global warming is also affecting epidemiology of various diseases including VBDs like Dengue. Consistent rise in temperature is hastening life cycle of aedes & virus maturation, thereby changing disease transmission dynamics. It is high time that we should reduce our absolute dependability on fossil fuels. Strengthening our public transport system is one novel way to reduce our carbon prints & slow down warming of global environment. We also need to develop efficient public health system in our urban localities. Provision of affordable housing is also one aspect of Dengue control.

Reasons for rise of Dengue are outside the ambit of public health. Obviously, its solutions need to be sought outside public health. Duane Gubler's observation, "We do not do anything until there is crisis and then we try to react to it & it's always too little, too late," asks all of us to have more comprehensive & timely strategy for Dengue containment and don't forget charity begins from home.

By Pradip Awate
State Surveillance Officer,
Integrated Disease Surveillance Programme,
Maharashtra