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Editorial

Challenges and perspectives in dengue control: Are we ready to tackle the rising threat?

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1. Introduction

Dengue is a rapidly emerging vector borne disease and a major public health concern globally. Dengue is an arboviral infection transmitted to humans by the bite of mosquitoes like *Aedes aegypti* and *Aedes albopictus*. According to the WHO Global Dengue Surveillance, it has been reported that the total number of dengue cases was 13,860,025, with a total of 9990 deaths from the month of January to November 2024.[1] The global incidence of dengue has almost doubled in the past three decades from 1990 to 2021 surging from 26.45 million to 58.96 million cases.[1] National Vector-Borne Disease Control Programme (NVBDCP) has taken up several preventive and control measures against dengue focusing on early diagnosis, prompt treatment and integrated vector management. But, whether these measures are enough to battle with the Dengue virus (DENV) infection in India is a million dollar question. Novel strategies to estimate the disease burden and swift control measures are the pressing need of the hour.

2. Influence of Climate

The change in the climate is the major factor influencing the incidence of *Aedes aegypti* and *Aedes albopictus* mosquito-borne dengue illnesses.[2] The burden of the disease is escalating worldwide due to environmental and climatic changes. It is quite difficult to achieve predictions for the disease prevention because of the non-linearity and the dissimilarity in the dengue – climate relationship. It has been reported that moderate rains during summer monsoon leading to increase in dengue mortality, while heavy rains reduce the disease incidence through the flushing effect predicting dengue-monsoon association.[2]

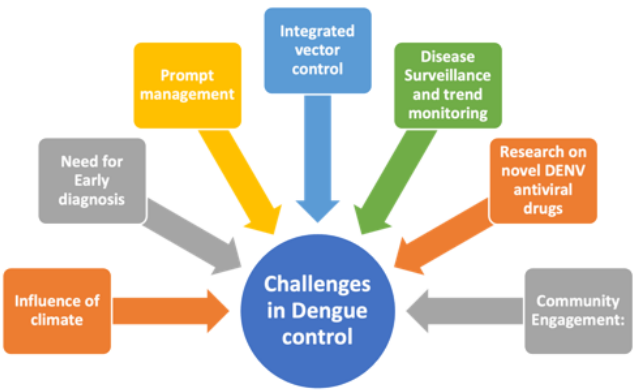

Figure 1: Challenges in dengue control

3. Need for Early Diagnosis

Along with the environment and climate changes, the social and behavioral factors promote the transmission of dengue viral infection.[3] Diagnosis of Acute Dengue infection is

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challenging because of the non-classical symptoms and the poor sensitivity and specificity of the point of care tests. Moreover, multiple viral infections and cross reactivity of the rapid tests hinder the accuracy in diagnosis. IgM ELISA and PCR are the standard tests for diagnosing Dengue infection. An efficient protocol based diagnostic approach with early intervention is critical in reducing the severity of the illness, lessening the length of hospital stay and minimizing the occurrence of complications.

4. Prompt Management

As there is neither specific treatment nor any early marker for diagnosing which patient will progress to complications of vascular leakage, it is mandatory to closely monitor all the patients with Dengue infection. Though, the current treatment focusses on supportive care, there is an urgent need for new antiviral drugs. Many newer antiviral drugs against Dengue viruses are being evaluated along with drugs against mast cell products. TAK- 003 is a new recombinant live attenuated Dengue vaccine based on a DENV-2 backbone providing a genetic template for the DENV-1, DENV-3, and DENV-4 serotypes.[4]

5. Integrated Vector Control

In spite of several efforts in vector surveillance, dengue continues to be a public health challenge. Early reporting of Dengue cases would help in strengthening disease mitigation activities like actions on eliminating mosquito breeding sites, strengthening mosquito larvae surveys and immediate public health education. The change in the climate and unplanned urbanization are the major reasons which favour mosquito breeding.[5] In addition to insecticides and larvicides, Innovative vector control measures like release of *Wolbachia*-infected mosquitoes, which would help in reducing the spread of the virus can be initiated and established in areas with high burden.

6. Disease Surveillance and Trend Monitoring

Dengue surveillance is very important for detecting outbreaks and to monitor the trend of the disease pattern. Many at times, the test result data from the private diagnostic centers are not properly integrated with the government surveillance systems which is a great challenge faced by the government in estimating the disease burden. In order to accelerate timely interventions, the detection of outbreaks through surveillance systems is mandatory to mobilise the vector control measures and to reorganize the health care systems to prepare for a surge in cases. In addition, well-structured active surveillance components, good laboratory and health care system and supporting community motivation strategies would definitely strengthen surveillance measures. Syndromic surveillance approach is yet another appreciative tool.

7. Current Research Hunt on Novel DENV Antiviral Drugs

Due to lack of clinically approved antiviral drugs against Dengue virus, research is being intensified for developing newer antiviral drugs for dengue treatment. The non-structural proteins NS3 and NS5 are the main targets because of their major role in the replication of dengue virus.[6] Research is carried out on developing newer drugs which targets the viral components involved in replication of DENV like NS2B/ NS3 protease and NS3 helicase. Multisectoral collaboration and funding are essential for advanced research to analyse the long-term efficacy and safety of the antiviral drugs.

8. Community Engagement

Community participation is essential for operative dengue prevention and control. Effective coordination between the local community members, government agencies, non-governmental organizations and the common people is necessary for operative implementation of dengue preventive measures. The preventive and control measures of National Vector-Borne Disease Control Programme (NVBDCP) can be further strengthened by active community involvement and one health approach. Community awareness campaigns which are primarily action based should be encouraged.

9. Conclusion

The challenges faced by the Government to control Dengue includes the mosquito vector's adaptability to the change in the climatic conditions, the large number of migration of people from rural to urban areas, ideal breeding environment for the vectors, no proper cure or vaccines available for the disease, shortage of resources in healthcare systems, lack of community engagement, lack of funding for research on new antivirals, etc. Mortality and morbidity of the disease can be reduced by early diagnosis and a protocol based integrated approach. However, the overall efforts in developing roadway against dengue infection is still not enough to battle this deadly virus. The key to address the current challenges is multisectoral approach involving best practices accommodating robust surveillance system and newer disease mitigation technologies.

10. Source of Funding

None.

11. Conflict of Interest

None.

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