



INDIA'S DENGUE CHALLENGE: ACTIONABLE SOLUTIONS FOR A SAFER TOMORROW

Pharmacology

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ABSTRACT

Background: Dengue fever has become a major public health concern in our country, causing significant morbidity and mortality. Because there is no definite drug or commercially available vaccine for dengue, prevention is the only option. As a result, early reporting of dengue cases is required in order to implement preventive measures before the disease spreads to epidemic proportions. **Methodology:** Author has worked as Assistant medical officer for many years with Municipal corporation of Greater Mumbai (MCGM) and he has actually played role in dengue preventing practices at ground level in Mumbai. So, strategies and methods mentioned by author to control dengue can be practically very helpful to reduce dengue disease burden in society **Result:** If methods and strategies applied by MCGM, to reduce dengue burden in Mumbai, are applied to other parts of country, same massive reduction in dengue disease burden in country can be achieved.

KEYWORDS

Mumbai dengue, dengue prevention

INTRODUCTION:

Dengue fever, a mosquito-borne viral disease, presents a significant and escalating public health challenge across India. Transmitted primarily by the *Aedes aegypti*, disease is caused by the dengue virus (DENV), which circulates in four distinct serotypes.

It is a serious global public health problem, with 2.5 billion people at risk and an annual range of 50 to 390 million infections, which include dengue fever, dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS) and has emerged as global public health concern. [1,2]

Dengue fever has become more prevalent in India in recent years as a result of rapid urbanization, lifestyle changes, and poor water management, including improper water storage practices in urban and rural areas which has resulted in proliferation of mosquito breeding places. [3]

In India, dengue is major health concern. India's National Vector Borne Disease Control Programme (NVBDCP) reported 157,315 dengue cases in 2019 with 166 deaths, with most of the cases in the Western states, such as Gujarat, Maharashtra, and Karnataka [4]. These figures, however, consist of data only from government hospitals, neglecting India's large private health sector, which covers approximately 80% of all dengue-related healthcare visits [5]. One estimate suggests the real case number to be 200–300 times more than the reported cases per year [6]. Although dengue is a notifiable disease in India, some estimates suggest that the disease is underreported [7], so actual numbers are likely higher.

While Southeast Asia contributes to 53% of the global dengue disease burden, India alone accounted for 34% of the apparent dengue infections worldwide in 2010 [8].

The problem of dengue in India is multifaceted and influenced by a complex interplay of environmental, social, and biological factors. Uncontrolled urbanization, inadequate waste management, and changing rainfall patterns contribute to an increase in mosquito breeding sites, further exacerbated by the impact of climate change, which extends the mosquito breeding season and expands its geographical reach.

India reports a substantial number of dengue cases annually, with the incidence experiencing a concerning surge in recent years. For example, in 2024, over 230,000 cases were reported, significantly higher than the 157,315 cases reported in 2019. [9] The economic burden of dengue illness in India is also substantial, as highlighted by a 2018 study that estimated the costs in 2016 to be \$5.71 billion, a nearly three-fold increase from 2013.

Mumbai, located in the Western state of Maharashtra, is the most populous metropolitan city in India, with an estimated population of more than 20 million people. A large part of the population lives in semi-permanent housing and squalor, with poor water supply. This

leads to people storing water in large containers, either inside or outside their housing, inadvertently providing habitats for the breeding of mosquitoes. [10]

According to MCGM data, dengue cases saw a substantial decrease from June 2023 to June 2024, showing a 70% drop compared to the previous year. This decline is attributed to the MCGM's intensified efforts and public awareness campaigns.

MCGM, has employed a multi-pronged approach to reduce dengue cases in Mumbai, leading to a significant drop in reported cases in recent times. Author has worked as assistant medical officer for many years with MCGM and has witnessed all strategies and preventive measures to control dengue in Mumbai. So same preventive measures can be applied to reduce disease burden in rest of country.

Methods:

Following methods and strategies were carried out by author in Mumbai to control dengue as part of MCGM activities during 2011 to 2018

1. Environmental Management And Source Reduction:

• Identifying And Eliminating Breeding Sites:

WE actively searched for and removed stagnant water sources, which were prime breeding grounds for *Aedes* mosquitoes, the vectors of dengue.

- **Eliminating Stagnant Water Where Mosquitos Breed Is Paramount.** We regularly checked and emptied water containers like buckets, coolers, flower pots, tires, and discarding solid waste such as coconut shells, as highlighted by the National Center for Vector Borne Diseases Control (NCVBDC). This helped us to reduce mosquito breeding sources.

- **Inspecting High-rise Buildings:** where water can collect in areas like flower pots, money plants, which can become breeding grounds. Here we conducted awareness activities among residents of high rise building so that they could remove breeding sites from their house

• Managing Water Storage:

WE emphasized the proper covering of stored water to prevent mosquito breeding and promoted reliable water supply to minimize the need for uncovered water storage.

• Promoting Weekly Dry Days:

We encouraged residents to participate in weekly dry days, where they empty and dry potential breeding containers. Our health care workers constantly paid attention so that dry day was followed.

2. Public Awareness And Behavior Change:

• "Bhag Machchar Bhag" Campaign:

We launched this campaign to raise public awareness about dengue prevention, encouraging citizens to take personal responsibility in eliminating breeding sites and protecting themselves. This campaign

utilizes celebrities to spread awareness messages through various platforms including short films and social media, encouraging citizens to take precautions and eliminate breeding sites.

- **MCGM developed 'Mumbai Against Dengue app':** This app provides information on identifying and eliminating mosquito breeding sites, encouraging citizen participation in reporting and addressing potential breeding grounds

• **Educating Citizens:**

We conducted educational programs and distributed information materials to inform residents about dengue symptoms, prevention methods, and the importance of seeking timely medical care.

Breeding site for dengue mosquito is artificial collection of water like money plant water, air conditioner water, freeze water which is more in high rise building. Educating these residents in high rise building was difficult task. So, in high rise building we carried awareness activities with help of mike and loud speaker. We used to take complete round of building with health care workers with mike and loud speaker, playing information regarding preventive measures of dengue so that resident of that particular building could listen it. Also, we displayed poster regarding dengue near lift or stair cases of building so that it is easily visible to residents of building.

- **Educational Initiatives:** Awareness programs and campaigns were conducted at various levels, including schools, colleges, government, and private institutions, as well as in hospitals, to educate individuals and communities about dengue prevention, detection, and source reduction.
- **Involvement Of School And College Students:** We co-ordinated with all municipal and private schools and colleges in health post area and conducted awareness activities in those students. With this effort we could reach more families of community to spread malaria information.

• **Promoting Mosquito Net Usage And Repellents:**

We encouraged the use of mosquito nets, particularly for children and the elderly, and the application of mosquito repellents containing DEET or picaridin.

- We instructed residents and focused on removing stagnant water in house, stagnant water removal near house. We advised them to use of long-sleeved clothing, repellent coils, liquid repellents, mosquito bed nets particularly to construction site workers. Anti-mosquito spray usage was also uncommon. So, we advised them to use anti-mosquito spray.

3. **Vector Control Measures:**

• **Fogging And Insecticide Spraying:**

We conducted regular fogging and insecticide spraying in high-risk areas, including slums and areas with a high density of mosquito breeding sites. This job was done by pest control department and we coordinated with them. We collected dengue case from private medical practitioners (pmp's). To collect dengue case from pmp's, we formed WhatsApp group where they reported their dengue cases. Our health care workers traced those cases and tried to detect additional cases in that area. Also, all attempts were made to remove breeding sites in that particular area which was required to prevent more new case. We also educated residents of building regarding dengue preventive measures and removing breeding places from their houses, in which active dengue cases were detected.

• **Anti-larval Operations:**

We deployed teams to identify and treat potential breeding sites with larvicides to prevent mosquito larvae from developing into adults.

We focused on reducing mosquito breeding sources by implementing measures like anti-larval treatments and identifying and eliminating potential breeding grounds, particularly in vulnerable slum areas and construction sites. This includes addressing stagnant water, which was a major concern, especially in areas like construction sites. We observed that construction sites are full of mosquito breeding places. As part of anti-larval measure health care workers were provided with 'Abate' and asked to put it in large water drum where majority of slum population store water. Abate is a brand of larvicide based on the active ingredient temephos.

- **Guppy Fish:** Also, we Introduced larvivorous fish like Gambusia

or Guppy in ornamental tanks.

- In coordination with our pest control department, we performed Indoor space spraying with pyrethrum and outdoor fogging with malathion to control adult mosquito populations.

• **Surveillance And Monitoring:**

We maintained a robust surveillance system to monitor dengue cases and mosquito populations, allowing us to target their control efforts effectively. Regular inspections of premises for potential breeding sites, including water storage tanks, cooling towers, and construction sites, were carried out by the MCGM insecticide branch. Also, our health care workers continuously searched for suspected dengue cases particularly in slum area and tried to remove all possible breeding places.

• **Capacity Building And Training**

We also invested in training programs for healthcare professionals and sanitation workers to enhance their knowledge and skills in dengue prevention and control.

- We conducted training programs for frontline staff, including public health workers, construction site supervisors, and private clinic personnel, to improve their knowledge and skills in dengue control.
- As a part of pre monsoon preparedness author was one of the key trainers for training public health worker i.e., staff nurse and community health workers of all health post of western sub urban area of MCGM. (Lying between Bandra and Dahisar)

4. **Inter-sectoral Coordination:**

• **Collaboration With Other Departments:**

The MCGM coordinated with various other government departments, including Urban Development, Rural Development, and Water Supply and Sanitation, to implement a comprehensive approach to dengue control.

• **Public-private Partnerships:**

We collaborated with private healthcare providers and organizations to expand the reach of their awareness campaigns and vector control efforts.

We found that dengue is more common in high rise buildings as breeding sites for dengue mosquito is artificial collection of water which is more there. Most of patient from high rise building visits private health care providers. Thus, we trained and sensitizes private health care providers also.

5. **Other Initiatives:**

- **Legislative Measures:** MCGM enacted and enforced laws and by laws to regulate water storage and avoid mosquito genic conditions in various settings like construction sites and factories.

By implementing these measures, the we minimized the risk of dengue transmission and reduce the overall burden of the disease in Mumbai. These measures, in conjunction with citizen participation, were crucial for effectively reducing the dengue burden in Mumbai.

DISCUSSION

In this article, author has suggested preventive measures that he practiced in MCGM Mumbai as Assistant medical officer, to control dengue disease burden. Same can be used to control dengue in rest of India. Recognizing the gravity of the situation, the Indian government, through initiatives like the National Vector Borne Disease Control Programme (NVBDCP), is actively working towards dengue prevention and control through surveillance, case management, vector control, and public awareness campaigns. However, challenges like the complex biology of the Aedes mosquito, insecticide resistance, the lack of a universal vaccine, and the presence of multiple serotypes necessitate ongoing efforts and research to mitigate the spread and impact of this persistent public health threat. The primary focus of dengue prevention in India revolves around integrated vector management (IVM), aimed at reducing the population of the Aedes mosquitoes responsible for transmitting the virus

CONCLUSION

Effective dengue prevention in India necessitates a multi-faceted approach that integrates a comprehensive IVM strategy with robust community engagement, supported by ongoing vaccine development and proactive adaptation to the challenges posed by climate change.

Continuous research, improved surveillance, and strong inter-sectoral coordination are crucial to ensuring the effectiveness and sustainability of these efforts.

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