

# Fogging is a Puerile Exercise: A Preliminary Study Done in The City of Kolkata, India, Following the Outbreak Of DF/DHF In 2017, Has Revealed

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## **Abstract:**

In 2017, the impact of fogging on transmission of dengue was studied in Kolkata City, India. As revealed, the measure failed to yield any positive results. Despite the massive fogging being carried out in different municipal wards, no sign of reduction in the number of dengue cases was visible. At the behest of Atin Ghosh, deputy mayor [erstwhile mayoral council member [health] of Kolkata Municipal Corporation, the fogging was banned in 2019 and an era of vector management by applying all possible means of source reduction brought in.

**Keywords:** Kolkata City, Dengue, *Aedes aegypti*, Fogging, Pyrethrum 2% Extract, Political Leader, Source Reduction, Political Will

## **Introduction:**

The city of Kolkata, which sprawls on 206 square kilometres and is inhabited by a populace of 4.5 million [as per the Census of 2011] together with a daily floating population of 6 million, is endemic for dengue and *Aedes aegypti* is the primary vector. Like many other places around the world, here too, fogging was once considered to be an effective means of preventing transmission of mosquito-borne diseases [malaria and dengue, etc]. For a period of over two and half decades, the civic authorities had continued this work at the insistence of political leaders, bureaucrats, celebrities and other VIPs, and spent lakhs of rupees from the KMC exchequer for this purpose. In 2017, a study was undertaken by the Vector Control Department [Health] of the Kolkata Municipal Corporation [KMC, in short] to evaluate the impact of fogging on spread of dengue in the entire area of KMC. The present paper reports the observations of that study.

**Materials and Methods:** The KMC area is divided into 16 boroughs comprising of a total of 144 wards. The study was conducted in all the 144 wards of KMC. Since *Aedes aegypti* is widely presumed to have a maximum flight range of 50-100 metres from the site of its emergence, fogging with pyrethrum (2% extract from the petals of *Chrysanthemum cinerariaefolium*) was carried out within a radius of 100 metres from dengue-affected households within 24 hours after receiving the case notification [13]. Fogging was repeated within 7-10 days after the first round of fogging everywhere. Monthwise reports

on dengue cases collected and reported by 144 wards of KMC were obtained from the IDSP [Integrated Disease Surveillance Programme] wing of KMC and comparative analysis done.

### Results and Discussion:

In 2017, altogether 2374 cases of dengue with 5 confirmed deaths were reported from the KMC area. Sporadic cases of dengue occurred in the KMC area from January to June [6-16 cases/ month]. Thereafter, the number of dengue cases started rising. In the month July, 76 people became infected with dengue. The number of cases stood at 270 in August. The episode triggered media hype. Panic spread among the city dwellers like a wild fire. Politicisation of dengue began. Indoor fogging with pyrethrum started in different wards of KMC. Activities needed to reduce the breeding sources of *Aedes aegypti* virtually came to a standstill. The fogging operation continued for a period of 4 months (August to November), and it all ran indiscriminately at the insistence of different ward councillors. But the efforts proved abortive. Fogging could not check the rise in the number of dengue cases. September alone contributed 590 dengue cases and the contribution of October was 847. The number of cases registered in November was 63.3% higher than recorded in August. Fogging apart, awareness-raising campaign too continued simultaneously but people were least bothered about the need of their active involvement in the KMC-sponsored anti-dengue programme.

Over the past several years, public health authorities in different states of India have projected fogging as an effective measure for dengue prevention. Wherever and whenever there occurs an outbreak of dengue, the local political leaders — who in other times of the year remain deadly indisposed to oversee vector control activities in their electoral areas — suddenly become overenthusiastic and start pressing the vector control squads of the local civic bodies to undertake fogging to contain the disease. At their persistent nagging, fogging starts and it continues till the leaders give a signal for its stoppage. Crores of rupees from the public exchequer are spent every year on procurement of insecticides, fuels [diesel and petrol] and fogging machines. Sadly, no tangible evidences in proof of the effectiveness of fogging have poured in as yet. Fogging still remains a controversial issue [1].

A report of the Centre for Science and Environment [CSE] says that following a massive outbreak of dengue that involved 12531 cases with 32 deaths in Delhi and its adjoining areas as on 17 October in 2015, the Delhi government stepped up fogging with malathion as one of the measures to curb the outbreak. But the initiative failed to reap coveted rewards. Instead of declining, the number of dengue cases in Delhi increased; the figure rose from 778 in August to 6775 in September and 4925 in mid-October [2]. Duane Jane Gubler — globally acclaimed dengue expert — is of the opinion that effective *Aedes aegypti* mosquito control is virtually non-existent in most dengue endemic countries around the world. Over the past two-and-half decades, emphasis has been placed on ultra-low volume space spraying with insecticides to kill adult mosquitoes. But this measure has been found ineffective in controlling *Aedes aegypti* [3]. The World Health Organization has also questioned the role of fogging. The WHO now recognises that in most of the South-East Asian countries, space spraying has been adopted as the principal method of DF/ DHF control for the past 25 years, but it has failed to check the dramatic rise in the number of DHF cases in these countries during the same period. Space spraying has little effect on the mosquito population, and thus on dengue transmission [4]. In Asia and America, studies have shown that after application of the ultra-low volume spray, the density of the adult

population of *Aedes* mosquitoes returned to the pre-treatment level within 2 weeks and even with multiple applications, the impact of the spray was minimal [5].

The most annoying report on fogging has come in from the city of Bandung, Indonesia. In a recently concluded study, relationship between the fogging focus and incidence of DHF cases in Bandung from 2010 to 2015 was analysed. The analysis has revealed that the frequency of fogging focus and incidence of DHF cases were positively correlated, thereby suggesting that the higher the frequency of fogging focus, the higher the incidence of DHF cases [6].

Despite being strongly opposed by entomologists, dengue endemic cities/ towns in different states of India and many other countries around the world still resort to fogging as a measure for dengue control and the instructions for running such a futile show come from the health ministers, mayors of municipal corporations, chairmen of municipalities, councillors, bureaucrats and others.

What warrants the political leaders to opt for fogging? The answer is very simple. They do it just to prove the efficiency of the government (a pure hogwash though) in tackling dengue [4, 7]. The truth is that fogging or ultra-low volume spraying is a pure hogwash! This very activity creates only a false sense of security among the residents who then continue to do nothing to control the mosquitoes in and around their homes, thus perpetuating the epidemic cycles. The end result is that neither the government nor the public do anything to prevent the social disruption that accompanies epidemic DF/DHF. Instead they live from epidemic to epidemic under the misguided belief that it is beyond their control [8].

Public health authorities in different states of India — who recommend fogging with pyrethrum for dengue prevention — could learn a lesson from Thailand. A team of scientists from the University of California, US Medical Component of Bangkok-based Armed Forces Research Institute of Medical Sciences and San Diego State University carried out field trials involving space spraying with pyrethrum mixture both indoors and outdoors by using ultra-low volume sprayers to control *Aedes aegypti* population. But the results yielded by the efforts were quite frustrating. Within 7 days after the spraying, the area that had been sprayed became infested with *Aedes aegypti* mosquitoes to the extent of 50% of their original number. Spraying the outdoor area and doubling the spraying time per room had a significant impact on mosquito numbers only for 1 day post spraying [8].

Another shocking point about fogging is that not only is it ineffective in containing dengue but also harmful for the health of people, said Chandra Bhushan, deputy director general of the Centre for Science and Environment [2]. Whatever be the kind of thermal fogging — be it indoor or outdoor — the fogging mix contains diesel to the tune of 95% along with an insecticide, mostly malathion while outdoor fogging and pyrethrum while indoor fogging. In the *Revised and Expanded Edition of its Comprehensive Guidelines for Prevention and Control of Dengue and Dengue Haemorrhagic Fever* brought out in the year 2011, the World Health Organization has categorically mentioned that all pesticides are toxic to some degree [4]. After interviewing different experts, the Centre for Science and Environment has reported that diesel contains carcinogens. When a mixture of diesel and an insecticide is sprayed, the concoction is not only inhaled but is also absorbed in soil and water. Direct inhalation of diesel fumes, combined with insecticides, can exacerbate asthma or bronchitis among those with respiratory ailments. Diesel fumes can also cause irritation and itching on skin and eyes. Prolonged exposure could lead to temporary swelling of the corneas [2].

Above all else, fogging is a highly technical job. Most of what we think we know about fogging is useless. There are many preconditions that one must duly fulfil to make the drive efficacious. Some of

the determinants of effective fogging as prescribed by the World Health Organization are enrolled here [9,10,11,12]:

**1. Timing of the day of operation:** Fogging should be done either in the early morning [0600–0830 hours] or late afternoon [1700 –1930 hours] that corresponds with the peak biting times of the dengue vectors, *Aedes aegypti* and *Aedes albopictus*.

**2. Size of the insecticide droplet:** It should be 10 to 30  $\mu\text{m}$  so that the insecticide droplet could remain airborne for sufficient time.

**3. Frequency of fogging:** Fogging should be repeated within 7-10 days after the first round of fogging in areas where dengue cases have been reported or vector density is high. Repeat fogging at every 2-3 days interval for 10 days will be required when a rapid reduction in vector density is essential, such as in emergencies. Further fogging should then be carried out once or twice a week to sustain suppression of the adult vector population.

**4. Speed of wind:** Fogging operation should run when the wind speed is 3.6-15 km/hour to let the insecticide droplets drift downwind from the line of travel and impinge on the bodies of insects. One can easily measure the wind speed using a handheld instrument called anemometer.

**5. Ambient air temperature:** It should be less than 28<sup>0</sup> C.

**6. Speed of the vehicle:** The vehicle mounted with a fogging machine should ply at a speed of 6-8 km/hour.

**7. Area of coverage:** It is widely assumed that *Aedes aegypti* has a maximum flight range of 50-100 metres from the site of its emergence. Based on this information, for an area with a surveillance system in place, the WHO has prescribed fogging to be carried out within a radius of 100 metres from dengue-affected households within 24 hours after receiving the case notification [13]. But this prescription too may not serve our purpose. In a study done in Puerto Rico, USA, *Aedes aegypti* females were found to disperse more than 400 metres primarily in search of oviposition sites [14]. Given the fact, we need to extend the area of spray from 31428 m<sup>2</sup> to 502857 m<sup>2</sup> to make fogging effective. But who cares?

Evaluating the efficacy of fogging is another big problem. The standard procedure for judging the effectiveness of space spraying is to calculate the parous rate of *Aedes aegypti* mosquitoes [i.e. the number of gravid female mosquitoes captured per house per person] before and after spraying. If the parous rate comes down to 10% or less within two days after spraying, this will indicate that the spraying has been effective [13]. But how is this possible? Where is the infrastructure?

The question that haunts me and many other entomologists around the world is that how many countries are following these tough guidelines to carry out fogging and other kinds of space spraying? Let me rephrase it. Is following such a tough prescription without having a suitable infrastructure at all possible? No. It's just not. And possibly this is the only reason why fogging or any other kind of space spraying has turned out to be such a puerile exercise almost everywhere around the world. The opinion of Chandra Bhusan may sound bitter to many of our public health authorities, but in my opinion, what Mr

Bhusan has said about fogging is apt [2]. According to Mr Bhusan, “Fogging diverts attention from preventive action for dengue by the state and community. It is only a way of appeasing people at the cost of their health. The government needs a systematic sanitation drive and emphasis on clean surroundings so that mosquito does not get breeding grounds. The community has a very important role to play in controlling dengue by keeping private premises clean.”

Clearly, fogging is not the solution. To effectively control *Aedes aegypti*, we need to shift our focus from fogging to reduction of breeding sources of this vector mosquito. The World Health Organization says that insecticide sprays and chemical larvicides have little impact on controlling dengue epidemic. In contrast, vector control through larval monitoring, source reduction and personal protection — combined with a good sanitary environment within households and in communities — are effective in preventing dengue [15]. It has also been pointed out by the WHO that fogging is expensive and time consuming. Therefore, measures undertaken by the community to prevent mosquito breeding are far more cost-effective than containment measures once an outbreak occurs [16]. The most effective way to control *Aedes aegypti* is elimination or cleaning of water-holding containers that serve as the larval habitats for *Aedes aegypti* in the domestic environment [17]. The Directorate of the National Vector Borne Disease Control Programme, Government of India, has also declared that larval control is more economical and provides sustainable control by eliminating the source of newly-emergent adult mosquitoes [6].

Having realised this, Atin Ghosh, mayoral council member [health] of Kolkata Municipal Corporation [KMC] decided to stop fogging for prevention of dengue. Following his instruction, the Health Department of KMC printed leaflets containing messages against fogging and distributed among the city people, including political leaders. As a result of this campaign, people and political leaders stopped pressing the KMC for fogging. Since 2019, fogging in KMC area has been totally stopped. What instead has been prioritised is reduction of mosquito breeding sources by making phenomenal infrastructural development. Regrettably, the unproductive fogging is still done by many Urban Local Bodies and State Health departments as an effective means of preventing spread of dengue. The practice needs to be banned everywhere to win the yet-to-be-won battle against this arboviral disease.

If we really want to prevent dengue, we need to contemplate trying all possible tricks for prompt detection and reduction of *Aedes* breeding sources by involving all the departments of Health, Solid Waste Management, Building, Sewerage & Drainage, Irrigation, Public Works, Education, Law, etc. Above all else, we need a strong political will, which many countries around the world, inclusive of India, still lack abysmally.

The quinine-coated truth is that the highly visible fogging or any such work and, the reassurance by the government that they are controlling dengue outbreak/epidemic, results in a false sense of security by the public who then continue to do nothing to control the mosquitoes in and around their homes, thus perpetuating the epidemic cycles. The end result is that neither the government nor the public do anything to prevent the social disruption that accompanies epidemic DF/DHF. Instead they live from epidemic to epidemic under the misguided belief that it is beyond their control [4].

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