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A Patchy Approach to Fight Vector-Borne Diseases

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Karnataka: A Bruhat Bengaluru Mahanagara Palike worker carrying out fogging operations to prevent the outbreak of vector-borne diseases such as dengue and chikungunya in Bangalore on August 24, 2015. File photo: Sampath Kumar, G. P.

Every year, Delhi's residents are affected by mosquito-borne diseases like dengue and chikungunya. This year, the national capital saw one of its worst outbreaks. Despite hosting the country's policy making institutions, the State finds itself often paying a heavy price on account of these diseases.

*In this article, **Pallavi Mishra**, Senior Research Fellow at the Centre of Chronic Disease Control, Gurgaon, and **Ankit Agrawal**, freelance journalist, look at Delhi's complex administration and political structure that impedes effective vector control and public health measures. They also draw from examples from other States to highlight the need for a holistic approach to policy making.*

The State of Delhi, with a history of vector-borne diseases such as malaria, chikungunya and dengue, suffered from one of the worst outbreaks, especially chikungunya, this year. According to data released by the National Vector Borne Diseases Control Programme (NVBDCP), the central nodal agency for the prevention and control of vector-borne diseases in India, last year, dengue had infected 15,867 people and had killed 60 patients in Delhi[1] .

The latest data released by the South Delhi Municipal Corporation, which tabulates the data for vector-borne diseases in Delhi, states that 342 new suspected cases of chikungunya were reported in the week ending November 6, 2016, taking the total number of suspected cases to11,193 in the State [2] . Out of these, 8,938 cases have been confirmed [3] . Though the civic bodies in Delhi have kept the death tally at zero, the Press Trust of India reports that at least 15 fatalities were reported at various hospitals due to complications triggered by chikungunya [4] . In the case of dengue, 3,778 cases were reported in Delhi this season till November 6 [5] .

The good news, according to Srikant Sharma, senior consulting physician in Moolchand Hospital, is that “the numbers have gone down a lot—at least 80 per cent since the peak in September-end” [6] . Although Municipal Corporation of Delhi (MCD) has confirmed only four deaths because of dengue, the independent news agencies have confirmed 25 deaths based on official records of hospitals [7] .

The above mentioned diseases (malaria included) break out every year with predictable regularity. However, state machineries seem to be consistently failing in addressing this public health crisis on the immediate and long-term basis over the years. And in October 2016, the threat of possible spread of H5N1 Influenza (Avian Flu) gripped the national capital, when the health system had not yet fully recovered from the spread of dengue and chikungunya [8] . Despite public interest waning on this issue due to a succession of events - including the announcement by Prime Minister Narendra Modi demonetising currencies valued Rs. 500 and Rs. 1,000, although in a staged manner, and the incessant aggression along the India-Pakistan border that is being played out in the media and the social networks- this is the appropriate time to dispassionately analyse it in retrospect. Such an approach, it is hoped, will shape public opinion on a matter that has implications for public health, not only in Delhi, but in other parts of India that are vulnerable to such outbreaks.

The condition in Delhi, however, is not the worst among States. According to NVBDCP data, between 2010 and October 2, 2016, Karnataka registered the highest number of chikungunya cases at 56,577 (32.63 per cent of the total cases in India), while Delhi was at the seventh position with 6,993, cases (4.03 per cent of the total cases). In the case of dengue during the same period, Delhi reported the most number of 34,052 cases (9.31 per cent of the total cases).

Interestingly, despite registering the maximum number of cases during this period, Delhi was able to control the number of deaths due to dengue. Maharashtra with 218 deaths (18.72 per cent of the total deaths) occupied the top spot, while Delhi was in the fifth position with 93 deaths (7.98 per cent of the total deaths).

Between 2010 and November 5, 2016, Karnataka reported the maximum number of chikungunya cases at 58,200 (30.36 per cent of the total cases in India), while Delhi was at the fifth position with 11,519, cases (6 per cent of the total cases). It is important to mention here that while Karnataka was always one of the most affected States, Delhi registered just 326 cases between 2010 and 2015 [9] . In the case of dengue between 2010 and November 5, 2016, Delhi reported the 35,697 cases (8.92 per cent of the total cases). Interestingly, despite registering the third highest

number of cases during this period, Delhi was able to control the number of deaths due to dengue. Maharashtra with 236 deaths (18.97 per cent of the total deaths) occupied the top spot while Delhi was in the fifth position with 93 deaths (7.47 per cent of the total deaths) [10] .

Despite being worse off in terms of incidence and deaths, many States didn't receive the media and administrative attention they deserved. It is important to note here that the outbreak of all six major vector-borne diseases—malaria, filariasis, dengue, kalaazar or visceral leishmaniasis (VL), Japanese encephalitis, and chikungunya—is preventable.

Trapped between multiple agencies – public health management in Delhi

Delhi being the capital of India is a peculiar case due to various reasons. It has a complex and much debated political structure with an elected Legislative Assembly and a Chief Minister, a Union government-appointed Lieutenant-Governor (LG) as an administrator and various municipal corporations for local self-governance and addressing issues related to public health, sanitation, conservancy and solid waste management [11] . Thus, despite health being a State subject according to the Constitution of India, the health governance-related issues in Delhi are overseen by the Ministry of Health and Family Welfare (MoHFW) and the State's health ministry through the LG [12] . Despite all this, in the past many years, Delhi has witnessed huge outbreaks of vector-borne diseases. Taking the history of outbreaks in Delhi, the recent one did not come as surprise at all.

In addition to the above mentioned peculiarities, there are several reasons why the case of Delhi should be highlighted: First, being the capital of India, the State is the fountainhead of policy making and implementation. Second, the large presence of media, an active civil society and advocacy groups not only influences policy making but also works as an important feedback mechanism. Third, Delhi has the eighth highest literacy rate in the country and high penetration of the media , which makes it easier to achieve the intended results in public health campaigns through Information, Education and Communication (IEC) method [13] , [14] . Fourth, Delhi is the most urbanised state in the country having one of the highest accessibility to healthcare [15] . Fifth, the Delhi government has taken a unique initiative in the form of *Mohalla* (community) Clinics to make basic healthcare accessible and decongest higher level health facilities. Each clinic is staffed by a doctor, a nurse, a pharmacist and a laboratory technician [16] . Despite all the above mentioned factors, in the past decade, Delhi has become a place of various outbreaks. This year it is chikungunya, whereas till last year it was dengue in the monsoon season and N1H1 (a zoonotic disease) during winter. The history of the outbreaks of vector-borne diseases is quite long in India. Malaria and dengue are prevalent in India for the past three centuries [17] .

The National Malaria Control Programme was started in 1953 to tackle malaria in independent India. However, "the first recorded chikungunya outbreak was in Kolkata in 1963. This was followed by epidemics in Tamil Nadu, Andhra Pradesh and Maharashtra in 1964–65 and in Barsi in 1973. The chikungunya virus then seems to have disappeared from India" [18] . The virus re-emerged after a gap of 32 years in 2006 and caused a massive outbreak affecting 13 States, starting from Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, and Gujarat to Kerala. This outbreak affected people of all ages and sexes [19] . It is important to mention here that though the chikungunya virus is not directly responsible for death, it results in co-infection of dengue and Zika [20] . However, due to low immunity and chronic health issues, many old patients and infants die of chikungunya.

The most highlighted news by the various media channels in Delhi was about the tussle between the State and the national public health authorities with regard to the ongoing crisis and not the breakdown of the systemic response

before, during and after the crisis. Amidst all the ongoing allegations and the blame game in the political corridors of Delhi, the important question that needs to be asked again and again is who can be held accountable for the massive outbreak; who is responsible for the negligence, limited prevention and failing health systems in ensuring cure for these vector-borne diseases in Delhi? Is it the Delhi government headed by Arvind Kejriwal, the Union Health Ministry headed by J.P. Nadda, the BJP-led Municipal Corporation of Delhi, or us, the residents who are badly affected by these diseases?

Sadly, in the current scenario, none seem to be taking ethical and moral responsibility for the spread of these life-threating but preventable diseases. The issue plaguing India's health system is very complex and there is an urgent need to ask these questions in order to reach a conclusion so that, at least, some plausible solutions can be designed to address the current situation and prevent future outbreaks. The concerns revolve around four major stakeholders of the current debate: the State government, the Union Ministry of Health, the MCD, and the residents of Delhi.

The first concern is about the politicisation of the issue where both the governments are shying away from taking responsibility for the outbreak and deaths that occurred in last few days in the capital. Had the concern for public health been important, the Centre, the State government and the MCD would have reviewed and coordinated to overhaul the public health system. Ideally, the aim of the governments should be to take action in advance to prevent the spread of diseases so that any possibility of outbreak can be prevented and, in the worst case scenario, there should be alternative strategies in place to control the outbreak. However, rather than formulating evidence-based outbreak management plans in advance, such as enhancing epidemiological surveillance and being sensitive to the suffering of patients, both the governments and political parties indulged in mud-slinging.

The continued legal and ego tussle between two political parties the Bharatiya Janata Party (BJP), which heads the Union government and the Aam Aadmi Party (AAP), which heads the State government, over Delhi's governance has made the issue much more complex. The tussle over appointment of Chandraker Bharti by the Lt. Governor as Delhi's Health Secretary, after ignoring requests from the State government, and then granting him 15 days of leave when Delhi faced a public health crisis only highlights the discord among the various power centres [21] .

Likewise, the government's denial mode till the problem went out of control was evident when, instead of escalating the efforts to prevent outbreak after the data was released by the All-India Institute of Medical Sciences (AIIMS) and the NVBDC, the MCD and the Health Ministry of Delhi disputed those numbers, and maintained that there was "nothing to worry" [22] . The assurance from the Ministry and the MCD seemed to be an act of saving the situation. However, at the AIIMS, there was a mad rush of people for blood tests to diagnose these diseases. People were even heard pleading for blood donations for the infected patients in hospitals. In this mudslinging, neither the governments nor the patients are reaping any benefit, since the criticism from both the sides have effectively buried all possible alternative, immediate, and long-term measures that they should undertake.

Similarly, the BJP-led MCD, rather than efficiently implementing the preventive measures by regularly cleaning drains, , clearing septic tanks, spraying insecticides and residual fumigation, blame the Delhi government for non-cooperation. In many places, the fumigation drive is taking place in the afternoons, thus ignoring various guidelines of the government and World Health Organisation (WHO), which suggest early mornings and late evenings as the ideal time for such operations. Likewise, the residents aren't informed through megaphone about keeping the

windows and doors of their houses open during fumigation so that the fog could also kill mosquitoes living inside the houses.

Vector-Borne Diseases in Select States

States	Diseases	2010	2011	2012	2013	2014	2015	2016	Total
Delhi	Chikungunya	120	110	6	18	8	64	11,193	11,519
	Dengue Cases/Deaths	6,259/8	1,131/8	2,093/4	5,574/6	995/3	15,867/60	3,778/4	35,697/93
Tamil Nadu	Chikungunya	4,319	4,194	5,018	859	543	329	59	15,321
	Dengue Cases/Deaths	2,051/8	2,501/9	12,826/66	6,122/0	2,804/3	4,535/12	1,954/4	32,793/102
Karnataka	Chikungunya	8,740	1,941	2,382	5,295	6,962	20,763	12,117	58,200
	Dengue Cases/Deaths	2,285/7	405/5	3,924/21	6,408/12	3,358/2	5,507/9	5,318/8	26,775/64
Maharashtra	Chikungunya	7,431	5,113	1,544	1,578	1,572	391	4, 799	22,428
	Dengue Cases/Deaths	1,489/5	1,138/25	2,931/59	5,610/48	8,573/54	4,936/23	5,391/22	30,068/236

* Data of Dengue and Chikungunya is up to November 5, 2016.
Data taken from the National Vector Borne Disease Control Programme.

The Indian Meteorological Department had predicted a relatively good rainfall for this year in April, and ideally, knowing the history of the outbreaks of vector-borne diseases in the State, the Union and the State governments and the MCDs should have jointly reviewed the preparedness of the health system to prevent the current crisis [23] . However, during and after the monsoon, water logging and overflowing drains were common sights on roads and narrow streets in various residential areas in Delhi which provided an ideal breeding condition for the mosquitos. Even the public-awareness campaigns through various media platforms were not done timely.

For instance, the first time one of the authors of this article received the Delhi government's awareness SMS was on September 27 when the diseases broke out in July! The last such SMS was received on October 4. All the messages received in the said duration were in English. Ideally, the agencies should have sent these messages multiple times in many languages by then to cover the non-English speakers as well.

In the same manner, the pictorial representations of preventive measures weren't widely publicised. One doesn't find too many advertisements on popular local radio channels, bus-stops, and on the State transport buses since this was done during the implementation of odd-even policy in Delhi. These advertisements were put up in the last few months. Surprisingly, these preventive advertisements were publicised after the outbreak, which could also be seen as government's efforts to save face during the crisis. According to the yet-to-be-tabled CAG report,

> "The Delhi government issued advertisements worth Rs. 10.04 crore between September and November over the past three years (from 2013-14 to 2015-16) only after the outbreak of dengue. Thus, the very objective of spending to create awareness about the measures to prevent an outbreak was defeated[24]."

Moreover, there isn't much door-to-door campaigning being done in residential areas to generate awareness among the residents to help them adopt preventive measures. In most of the cases (80 per cent, according to a study), chikungunya affects people living below poverty line the most, due to their lack of resources and low immunity levels caused by malnutrition [25] . Such vulnerable people are less likely to follow the suggestions mentioned in awareness campaigns. It is also interesting to note here that nobody in Delhi thought of subsidising, distributing and promoting the habit of using long-lasting insecticidal nets (LLIN) to considerably reduce the chances of spreading the outbreak as the mosquitoes are most active in the early mornings, late afternoons, and in the evening before dusk [26] , [27] . This measure alone could be extremely effective as 99 per cent of Indians do not use mosquito nets [28] . In contrast, according to WHO estimates, countries like Bangladesh, Bhutan, Democratic People's Republic of Korea, Nepal, and Sri Lanka reduced the incidence of malaria by more than 75 per cent from 2000 to 2012 mainly by using nets, surveillance and early detection and effective treatment of the disease [29] . Not only this, earlier this September, Sri Lanka was declared free of malaria [30] .

In Delhi's case, the immediate response by the MCDs after the identification of cases was very slow and disappointing, as there was hardly any follow ups or heightened surveillance with the help of residents once the residual spraying was done by the MCD workers. It is important to mention here that outbreaks like these cannot be tackled only by fogging as it does not kill the larvae. Equal focus is needed on reduction of source, which can only be done successfully by involving the community in keeping their surroundings clean, preventing the stagnation of water and adding abate into the water to kill larvae in situations where the stagnant water cannot be removed, like in aquariums and coolers. None of this is rocket science.

This year the MCDs found breeding of mosquitoes total in 1,67,133 houses across Delhi. Interestingly, the maximum breeding spots, 83,232, were found in the area of South Delhi Municipal Corporation (SDMC), followed by New Delhi Municipal Corporation (NDMC) at 61,510 houses, and 22,391 in East Delhi Municipal Corporation (EDMC) area [31] , [32] . It is important to note here that NDMC and SDMC consist of the posh and well-planned areas of Delhi where the government servants and elites live [33] . One would suppose that the IEC activity would be more effective in these areas. It is also important to note here that the authorities launched 16,762 prosecutions, which is approximately 10 per cent of the cases [34] . Interestingly, according to a report by the Press Trust of India, the NDMC had issued 52 notices to the Rashtrapati Bhavan between January and August 2016 for mosquitoes breeding in several pools of stagnant water in the 230-acre complex. Last year, 125 such notices were issued [35] , [36] .

More than a seasonal outbreak

In spite of having such a long history of the prevalence of these diseases, India has failed miserably in adequately addressing the issue despite the presence of the media, and active civil society groups. High literacy rate and a largely urban ethnography of Delhi, too, could have helped in preventing the outbreaks. These outbreaks should not only be seen as a seasonal spread of diseases but as an alarm towards the failing health systems at all levels of the government—national, State and local self-governing bodies.

The outbreaks are also an alarm towards some other potential outbreaks in the future, such as Zika, which is carried by the *Aedes Aegypti* mosquito—the same mosquito that carries the viruses of dengue and chikungunya. The important question here is: are India's systems prepared to address any such unforeseen outbreak of Zika or any other infectious disease that may plague the health system? Like chikungunya, in case of Zika, too, there is no specific vaccine and only symptomatic treatment is given to the patients. The above question becomes more

pertinent in the current context where the central government is sending directives through various letters and circulars to the state governments in order to work towards containing any such outbreak. These outbreaks not only disrupt the health system but also create panic among the residents.

The recurrence of various outbreaks is not due to the lack of policy and programmes in the country, but because of the inefficient implementation of these policies. India's health system is marked by a lack of balance between retrospective and prospective policy making. In the context of last few outbreaks of infectious and communicable diseases in Delhi, it can be concluded that at least in these cases there seem to be a gap in retrospective policy analysis which could have helped us in designing policies for the future. Most of the policy documents analysed while writing this paper revealed that none of them reflected upon the causes of previous failures and inefficient policy implementation. A majority of the documents analysed have retreated the same measures directed over the years. No efforts were made to put these directives in the context of previous failures and update them.

In 2007, the NVBDCP came up with a Long-Term Action Plan for Prevention and Control of dengue and chikungunya, just after the massive outbreak of chikungunya in 2006. However, this long-term preventive strategy could not bring any change to curtail the seasonal outbreak of chikungunya and dengue. In February 2016, the NVBCD issued a letter to all States and Union Territories alerting them about the possibility of the spread of Zika virus.

Another important directive from NVBDCP was issued in June 2016 to all States where the potential outbreak of dengue was suspected, in which it is clearly mentioned that these vector-borne diseases are spreading to new geographical areas. For the first time this year, May 16 was observed as National Dengue Day across the country. On this day, the State governments were to initiate prevention and control activities that would continue till the end of the transmission season. According to a Demi-Official letter by the Director of NVBDCP, the emphasis was given on effective community-based vector control strategies through Intensive Behaviour Change Communication (BCC) campaigns for dengue control. In this regard, the month of July was observed as Anti-Dengue Month. It is important to mention that the order advised to carry out the campaign activity through mobile app 'India Fights Dengue' to empower the community [37] .

The strategies stipulated in this letter were "sustained, high-level government commitment, strengthening of public health infrastructure, inter-sectoral collaboration and community participation [38] ." The letter from the NVBDCP also emphasised on the use of an app, 'India Fights Dengue', to empower the community, but ironically, this app was not advertised widely in the media and various important places like the Delhi Metro and commercial hubs. The popularity of the app can be gauged from the fact that till October 7, 2016, the app was downloaded just 5,000 times. Though the app is slow but informative, a major drawback is need of an advanced smart phone with high speed connectivity that can use GPS facility. However, there is no substitute for a door-to-door campaign, especially on the weekends when people stay at home, in the residential areas to generate awareness for behaviour change. This is perhaps what is lacking in the current strategy. It was observed that towards the end of September, when the situation seemed to be going out of control, a vehicle with megaphone was used for spreading awareness in the residential areas of Delhi, but this did not cover densely populated areas.

As mentioned above, India began to observe Anti-Dengue and Anti-Malaria days. These Days also raise awareness of the grim public health situation in India. The lack of preparedness leads to chaos during the actual crisis, which could have been easily prevented by taking action in advance—first, by preventing vectors from breeding, and second, by sprucing up the existing system to address such crisis.

The WHO health system framework talks about six components of the health system—leadership/governance, health care financing, health work force, medical product and technologies, information and research, and service delivery. All these components should function in a balance to achieve health system goals, including the prevention and cure of any disease. Taking evidence from the current outbreak, it is evident that the Indian health system is not only facing a lack of balance among these components while drawing up public health strategy, but there is also a greater requirement of the translation of emerging knowledge and information into public health policy. The recent history of outbreaks in Delhi shows that diseases are taking precedence over the other but governments do not want to change previous strategies that causes public health crisis almost every year.

Tamil Nadu provides an example of how a balanced approach from the government can be helpful in not only curing the patients suffering from these vector-borne diseases but also to prevent them. The geographical position of the State fetches the total annual rainfall of 945 mm [39] . This makes it prone to the spread of vector-borne diseases. The epidemiological history of chikungunya since 2010 in Tamil Nadu shows that the number of infected people are constantly decreasing [40] . The Directorate of Health and Family Welfare of the Tamil Nadu government has not only laid out the strategy for containing the outbreak, but also emphasised on sustained strategy for preventing any future outbreak. For instance, in 2006, as a part of the chikungunya control strategy, it was ensured that each primary health centre that handled chikungunya cases had a doctor, a nurse, a pharmacist and a laboratory assistant, which also conducted mobile outreach camps in faraway villages apart from treating the patients coming to the clinic [41] . The government also emphasised on adopting an inclusive approach by integrating modern and traditional medicine in providing cure to the affected patients. The government deployed a Siddha doctor, who gave external ointments to treat body ache of the patient with the allopathic medicine to cure fever. The health care provider from PHC visited all the households in its area and every fresh water storage facility, including tanks, sumps, cisterns and vessels, were checked on regular basis. As a part of the preventive strategy the health service providers were instructed to add 2.5 ml of abate (a chemical named Temephos) for every 10 litres of water which was stagnant or stored, but not in the drinking water, which helped in destroying the larvae of the *Aedes* mosquito that spreads chikungunya. Further in every block, 10 workers were appointed to carry on this work for six more months after the control operation got over [42] .

In Delhi, the government's approach was to increase the number of beds in the hospitals, open Mohalla Clinics on all seven days, issue appeals to the public to ensure preventive steps are taken against dengue and chikungunya, check mosquito breeding points in government offices and Metro stations; and involve religious and traders organisations, and students of various schools and colleges [43] . It is important to notice here that unlike Tamil Nadu, the Delhi government did not focus on door-to-door visits and promotion of abates. The emphasis was more on the public appeal.

Focus on prevention

Lastly, in this scenario, the ultimate sufferers are the people in the State who not only lose money but, in some instances, even their loved ones. The consequences of the outbreak and failures of health services are borne by the people. Public property is never thought of to be utilised for sustainable good, but the available resources are exploited as much as possible with no thought for the future. Roads and streets are meant for walking and driving but they are used as garbage disposal spaces. This garbage, in turn, clogs the drains. In that process, the prospects of any such health crisis in future are ignored by citizens, on the assumption that fighting vector-borne diseases is an exclusive governmental responsibility.

The other issue is that 52 per cent of Indians indulge in self-medication [44] . This tendency to not consult the doctor in case of common symptoms like fever and seasonal flu coupled with the sale of prescription drugs over the counter makes the case worse in many instances. Once the case is out of hand due to misdiagnosis and delay in appropriate treatment, people then directly approach emergency care which also hampers health services for the less privileged who may actually need emergency care on an urgent basis.

Drawing lessons from the current and previous crises, governments should develop a multipronged strategy with focus on prevention of such outbreaks. One important takeaway from the recent outbreak of chikungunya is the need for an adequate surveillance mechanism, and governments should aim to put in place mechanisms that ensure round the year stringent surveillance of vector-borne diseases rather than doing it just during the outbreak of the disease. The State of Tamil Nadu presents a good example of such a strict surveillance mechanism that helped in reducing the number of chikungunya cases and preventing the outbreaks of vector-borne diseases.

In a country like India which is prone to the spread of many infectious diseases due to its geographical location, prevention of any diseases can be most cost effective and sustainable mechanism to ensure healthy lives to its population. The role of the community health worker is very important in the case of prevention of any infectious diseases at the local level. Therefore, training and adequately building their capacity to work towards preventing vector-borne diseases should be the primary focus of government. As these workers come from the local community, they are better aware of the problems in that particular area. This places them in an important position to act as a crucial link between policy makers and the local community, which can be helpful in taking timely actions by the public health authorities in the case of spread of diseases.

As Delhi is a cosmopolitan State, where people from all regions live, government should strive towards sending awareness information through SMS messaging services, not only in English but also in Indian languages. The messages must be sent periodically so that people can be alerted beforehand.

It is also high time that a collective demand for timely provision of amenities is made at the community level and a sense of shared responsibility by the citizenry to ensure that the gains from government's efforts to reduce the incidence of vector-borne diseases bear fruit.

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11.^ According to the XII Schedule of the Constitution of India, among other things, urban local bodies are responsible for:

• Urban Planning including town planning.
• Planning for economic and social development.
• Roads and bridges.
• Public health, sanitation, conservancy and solid waste management.
• Slum improvement and upgradation.
• Urban poverty alleviation.

12.^ Due to various disputes with the Lt. Governor and the Union Government on the exercise of legislative power and executive control in the administration of National Capital Territory of Delhi (NCTD), the Government of Delhi had approached the Delhi High Court, which held on August 04, 2016, that "it is mandatory under the Constitutional Scheme to communicate the decision of the Council of Ministers to the Lt. Governor even in relation to the matters in respect of which power to make laws has been conferred on the Legislative Assembly of NCTD and an order thereon can be issued only where the Lt. Governor does not take a different view", thus making the Lt. Governor the effective ruler of the NCTD.

The 194-page judgement also referred to the Parliamentary Debate of Rajya Sabha when the 69th Amendment to the Constitution was tabled. The Minister concerned had stated: "At no time in the past has it ever been considered possible to make Delhi a full-fledged State. The Constituent Assembly went into the matter in great depth. It was observed during debates that "in the capital city of a large federation like ours, the arrangement should be that in the area over which the federal Government has to function daily, practically in all details, that Government should have unfettered power, power which is not contested by another and subordinate Legislature.

"…… If Delhi is made, a full-fledged State it would be constitutionally impossible for the Central Government to intervene in any matter relatable to the State List, such as public order, public health, essential supplies, municipal services, etc." The judgement of the Delhi High Court. Last accessed on October 5, 2016.

13.^ According to 2011 census data, Delhi with 86.21 per cent literacy ranks on the eighth position. Last accessed on October 5, 2016.

14.^ There are an estimated 150 million active internet users in India. {Mumbai 16 million, followed by Delhi 12 million.) Source IAMAI-IMRB Internet in India report Cited in FICCI-KPMG Indian Media and Entertainment Industry Report. [Last accessed on October 5, 2016.] Average weekly time on Radio 892 minutes. Third highest among four metros. Source TAM Media research. Cited in FICCI-KPMG Indian Media and Entertainment Industry Report. Delhi has 95 per cent TV penetration Source TAM Annual Universe Update – 2015. [Last accessed on October 5, 2016.]

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17.^ The history of Vector Borne Diseases in India is quite long. According to Professor C.B. Maclean, the British Government supplied Warburg's Tincture to troops in India and other colonies" during mid-nineteenth century to prevent Malaria. In India, the first epidemic of clinical dengue-like illness was recorded in Chennai in 1780 and the first virologically proved epidemic of dengue fever (DF) occurred in Calcutta (now Kolkata) and Eastern Coast of India in 1963-1964. **Source:** Gupta N, Srivastava S, Jain A, Chaturvedi UC, 2012. "Dengue in India", *The Indian Journal of Medical Research,* September, Vol. 136(3), pp. 373-390. Last accessed on November, 30, 2016.

18.^ Cecilia D, 2014. "Current status of dengue and chikungunya in India", National Institute of Virology. Last accessed on October 5, 2016.

19.^ Ibid.

20.^ Wilmer E. Villamil-Gómez, et al. 2016. Zika, dengue, and chikungunya co-infection in a pregnant woman from Colombia, *International Journal of Infectious Diseases*, Available online 3 August 2016, ISSN 1201-9712. Last accessed on October 5, 2016.

21.^ As reported by *Indian Express*: LG Najeeb Jung had appointed Chandraker Bharti after overruling the appointment of Tarun Seem, appointed by the AAP government. LG had also approved fifteen days leave of newly appointed health secretary Bharti from September 5 to September 16. Last accessed on October 5, 2016.

22.^ As reported by *Indian Express*: Official figures compiled by the Municipal Corporation of Delhi (MCD) show that only 20 cases of chikungunya have been reported in Delhi this year but the AIIMS data shows that at least 391 samples tested positive for the vector-borne disease till August 20 — 92 per cent of the samples tested positive in July and August. Data available with the National Vector Borne Disease Control (NVBDC), the central nodal agency, showed at least 256 cases of chikungunya at various hospitals in Delhi. Last accessed on October 5, 2016.

23.^ IMD Director General, Laxman Rathore, in a press conference told media that the monsoon is likely to be "above normal" and likely to be 106 per cent of the average of 89 cm. Last accessed on October 5, 2016.

24.^ According to a news report in the *Times of India*, CAG in its report on the preparedness of the city government, municipal bodies and others in control and prevention of the disease has criticised the corporations for lack of effective surveillance, shortage of staff and logistics, and absence of a standard operating procedure in the civic bodies. The report points out that the corporations suffer from shortage of supervisory staff, ranging from 46 per cent to 97 per cent, and in the workmen cadre, from 20 per cent to 36 per cent. "In NDMC, there is no sanctioned posts of entomologist (scientists who study insects) while the sanctioned posts of epidemiologist and sanitation officers are lying vacant as of January 2016. There is a 12 per cent shortage of anti-malaria *jamadaars*. The CAG points out that despite this situation, many malaria inspectors, assistant malaria inspectors and field workers are still deployed on ministerial work." The federal auditor also found that 26 per cent of the available vector management pumps/machines in the corporations and 65 per cent of the available pumps/machines in NDMC were dysfunctional.

Given the multiplicity of agencies dealing with dengue prevention and control in Delhi, CAG suggested constituting an inter-agency coordinating mechanism. Last accessed on October 5, 2016.

The report also criticised various bodies for hugely under-reporting dengue cases and deaths. Last accessed on October 5, 2016.

25.^ The findings reveal that 80 per cent (2832/3541) of chikungunya-affected patients were below the poverty line according to the World Bank's definition of income level less than $1US per person per day (the calculated average family size was 4.5).

The socioeconomic impact of the chikungunya viral epidemic in India. Last accessed on October 5, 2016.

26.^ WHO's factsheet on chikungunya. Last accessed on October 5, 2016.

27.^ WHO's factsheet on dengue. Last accessed on October 5, 2016.

28.^ WHO, [online]. "World Malaria Report, 2014". Page 198. Last accessed on October 5, 2016.

The report also mentions that the government didn't purchase a single LLIN in 2012 and 2013.

29.^ WHO, 2014. "WHO calls for greater investment in the battle against malaria", April 24. Last accessed on October 5, 2016.

30.^ Donald G. Mcneil Jr., 2016. "'Big Success Story': Sri Lanka Is Declared Free of Malaria", The New York Times, September 12. Last accessed on October 5, 2016.

31.^ PTI, 2016. "Chikungunya, Dengue cases on wane in Delhi", *The Indian Express*, November 7. Last accessed on November 11, 2016.

32.^ PTI reported that on April 19, 2016, Delhi government had directed the schools to display a list of do's and don'ts at prominent places in their premises and generate awareness among the students about dengue and preventive and measures needed to check the outbreak of the disease in and around their houses. Last accessed on November 12, 2016.

A copy of the circular, issued again on September 7, 2016. Last accessed on November 12, 2016.

33.^ According to a 2011 study titled *Slums of Delhi* conducted by The Centre for Global Development Research (CGDR) on behalf of the Planning Commission, 477 slums were identified in Delhi. Maximum number of slums numbering 133 (27.88 per cent) is located in the West Zone, followed by South 128 (26.83 per cent), 87 in East (18.24 per cent), 68 (14.26) in North and 61 (12.79) in Central. It is important to note that the large concentration of slums in South zone are due to predominance of high income residential neighbourhoods; many important or major commercial centers; proximity to Okhla Industrial Estate; major national level educational and research institutions and massive construction activities. Whereas, the reason behind lower number of slums in Central zone is presence of an organized and controlled developed zone. The study can be accessed here. Last accessed on November 12, 2016.

34.^ PTI, 2016. "Chikungunya, Dengue cases on wane in Delhi", *The Indian Express*, November 7. Last accessed on November 11, 2016.

35.^ PTI, 2016. "Over 50 notices issued to Rashtrapati Bhavan over mosquito breeding", *The Indian Express*, August 21. Last accessed on November 12, 2016.

36.^ The 16,762 houses where authorities launched prosecutions will have to pay a fine of Rs 500. Please refer to the letter issued by Manish Gupta, Commissioner SDMC to various officials in Delhi on May 30, 2012. Last accessed on November 11, 2016.

37.^ Demi-Official letter of Dr. A.C. Dharival, Director, NVBDCP. Dated June 27, 2016. Last accessed on October 5, 2016.

According to the page 26 of the 2015 Central Secretariat Manual Of Office Procedure, Demi-Official Letter (DO) is… "Generally used in correspondence between Government officers for inviting their personal attention on the issue. Since demi-official letter is written in the first person in a personal and friendly tone, it should be addressed by an officer in a Ministry/ Department who is ordinarily not more than one or two levels below the officer to whom such communication is addressed. Communications to non-officials can also take the form of a demi-official letter." Last accessed on November 4, 2016.

Page 54 of The Department of Personnel Training's Distance Learning Module on Written Communication In Government Offices mentions that DO is generally used in correspondence between Government officers for an interchange or communication of opinion or information without the formality of the prescribed procedure. Last accessed on November 4, 2016.

38.^ Ibid

39.^ Chandran, R., and Azeez, P. A. Outbreak of dengue in Tamil Nadu, India. *Current Science* 109.1 (2015): 171-176. Last accessed on November 6, 2016.

40.^ Clinically suspected Chikungunya fever cases since 2010. Last accessed on November 6, 2016

41.^ rediff.com, 2006. "How Tamil Nadu fights Chikungunya", October 7. Last accessed on November 6, 2016

42.^ ibid

43.^ For the steps taken by the Government of Delhi to tackle the outbreak, please refer to the press releases dated July 26, 2016, September 13, 2016 and September 16, 2016. Interestingly none of these press releases mentions door to door awareness campaign and subsiding and promotion of mosquito nets.

44.^ As reported in *The Hindu* on April 13, 2015, according to a survey by Lybrate, a doctor-patient end-to-end communication platform, 52 per cent Indians indulge in self-medication. The easy availability of over-the-counter drugs for minor health ailments are leading to this menace. Last accessed on October 5, 2016.