Outbreak prone communicable diseases of public health importance in the northern districts of West Bengal – Current status & the way forward

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India is perilously poised on the threshold of an explosion of infectious diseases, some of which have witnessed re-emergence while others await apposite opportunity to do so. The State of West Bengal is uniquely positioned with its innate geographical vulnerabilities that favour outbreaks of a host of infectious diseases. The northern districts of this State are well known endemic areas for many outbreak prone communicable diseases like malaria, Japanese encephalitis, scrub typhus, dengue and kala-azar. An outbreak of Nipah virus in the recent past is a pointer towards the emerging and re-emerging threat in these regions and warrants urgent prioritization for surveillance and monitoring of these diseases. Identification of risk factors, challenges in delivery of primary healthcare, implementation of intervention strategies along with strengthening of healthcare setup are also the need of the hour. Multisectoral initiatives with emphasis on understanding the complex and rapidly evolving human-animal-vector dynamics as envisaged under the ‘One Health’ concept are indubitably important pillars in the effective management of these emerging public health challenges.

Key words Dengue - emerging diseases - Japanese encephalitis - malaria - One Health - scrub typhus - surveillance - West Bengal

The rapid urbanization, deforestation and enhanced human forays into forested land for leisure/livelihood coupled with changing climatic patterns have all colluded to fatally influence the complex dynamics of vector-borne, zoonotic and other infectious diseases¹². The fragile human-animal-vector interactions play a critical role in the spread of these infectious diseases into newer geographical expanses and also in the exponential rise in the number of outbreaks of these diseases¹². The importance of ‘One Health’ concept cannot be more clearly deciphered and understood in the present context, with a large number of re-emerging vector-borne and zoonotic diseases, poised to radically impact human lives and challenge the already burdened public health system of India.

With its innate geographical vulnerabilities, the State of West Bengal is favourable for outbreaks of a large number of infectious diseases. The northern districts of West Bengal (Figure) mainly Alipurduar, Jalpaiguri, Cooch Behar and Darjeeling, are heavily
forest, rich in wildlife biodiversity and share international borders with countries like Bangladesh, Bhutan and Nepal and inter-State borders with Indian States like Bihar, Assam and Sikkim (which shares the international border with China and Bhutan) which are also well-known endemic areas for many outbreak-prone communicable diseases. Jalpaiguri and Alipurduar districts of West Bengal are endemic for malaria with reports of outbreaks, deaths and drug-resistant *Plasmodium falciparum* cases. The North Bengal districts are endemic for Japanese encephalitis (JE) too with reported outbreaks in 2011.
and 2014. Scrub typhus (ST) outbreak was reported for the first time in the State from Darjeeling district in 2004. A dengue outbreak was also reported in Siliguri town of Darjeeling in the year 2005 and since then dengue has been endemic in the area. In 2001 and 2007 Nipah virus (NiV) outbreaks took place at Siliguri in Darjeeling district and in Nadia district, respectively with similar outbreaks also reported from the neighbouring country, Bangladesh since 2001. Kala-azar was restricted to two adjacent community development blocks in Darjeeling, which is in turn adjacent to Bihar State, Nepal and Bangladesh, all three of which are endemic for kala-azar. These diseases pose an incessant public health challenge with recurrent surge in cases and threats of outbreaks.

Although malaria has been brought under control, it nonetheless is responsible for causing high morbidity and mortality in West Bengal. After the JE outbreaks in Jalpaiguri (including Alipurduar, which became a separate district in 2014) and Cooch Behar and Darjeeling in 2011 and in 2014, vaccination against JE was conducted in campaign mode for children and adults between 2012-2013 and 2015-2016 respectively and also introduced in the Routine Immunisation programme as per the Operational Guidelines under the National Programme for Prevention and Control of Japanese encephalitis/Acute Encephalitis Syndrome (2014). ST, a re-emerging disease in India, first reported from West Bengal in 2004 from Kurseong in Darjeeling, has remained endemic since. The area is now well recognized as a veritable hot spot of ST. Till date, the West Bengal State Health department has officially declared malaria (2018), JE (2017), dengue (2017) and kala-azar (2017) as notifiable diseases entailing their reporting by all government and private hospitals/laboratories, including non-governmental organization (NGO) run hospitals, as well as individual medical practitioners to strengthen capturing of surveillance data.

The northern districts of West Bengal share porous international borders with Bhutan and Nepal and inter State borders (Figure); this coupled with the presence of a large number of army units in the region, ensures a steady perennial influx of large populations in the region. Additionally, Siliguri being the gateway to the North-Eastern States of India and a business hub also encourages enormous, movement/migration, thus setting the stage for outbreaks of many communicable diseases. Thus, this review was undertaken to tabulate the status of outbreak prone communicable diseases in the region to highlight the issues at hand and emphasize the need for strategic planning of public health actions, which in turn would ease the burden of the emerging and re-emerging diseases.

**Data Collection**

Annual consolidated data on JE, scrub typhus and dengue for five North Bengal districts (Darjeeling, Kalimpong, Jalpaiguri, Alipurduar & Cooch Behar) and the State along with consolidated district data on malaria and kala-azar for the years 2018-20 were collected (personal communication). Data on malaria and dengue outbreaks from the five districts was also collected from published literature. Data on clinically suspected ST cases were collected from the treating physicians from two hospitals in Kurseong (personal communication) sub-division catering to areas of high risk for ST in Darjeeling district. Published literature online using medical journal search engines (PubMed and Google Scholar) on ST, malaria, dengue, JE, NiV and kala-azar disease burden for the year 2019 and reported outbreaks of these diseases in India, Bangladesh, Nepal and Bhutan since 2000 were searched. Entomological studies done in relation to these diseases, and abstracted information on reported outbreaks, hospital and community based serosurveillance data were also covered along with government documents related to disease control from the State health website.

**Observations**

**Malaria:** Malaria is endemic in India, Bangladesh, Nepal and Bhutan, with reported 3,38,494 [Plasmodium falciparum (Pf) cases 45.7% and 77 deaths)] 17,225 (Pf 85.6% and 9 deaths), 1,438 (Pf 0.6% and zero deaths) and 42 (Pf 9.5% and zero deaths) cases respectively in 2019. Bhutan and Nepal, which were among the 21 countries earmarked for elimination of malaria by 2020, reported one and 127 indigenous malaria cases respectively in 2019. West Bengal contributed to 7.5 per cent of the total malaria cases in the country and is one of the four high burden States for malaria in India where the High Burden High Impact (HBHI) approaches are to be implemented under NVBDCP (National Vector Borne Disease Control Programme). No spurt in the number of cases or outbreaks of malaria was reported from any district of the northern part of West Bengal during 2018-2020.

**Dengue:** Many outbreaks of dengue are reported from India, Bhutan, Bangladesh and Nepal since 2000.
Dengue incidence in these four countries in 2019 was 1,36,422 (till November 2019), 1,01,000, 14,662 and 5935 respectively. A visible rise in dengue cases was reported across the State of West Bengal in 2019 (47,928), with Darjeeling district recording 1,244 cases in 2018 and 1,279 cases in 2019, with Cooch Behar and Alipurduar districts reporting 576 and 2,542 cases respectively in 2019 (unpublished data). There was an upsurge of cases in 2019 at Jaigaon town (Alipurduar) adjacent to Phuntsholing city (Bhutan), which experienced a huge outbreak in 2019. The West Bengal State Health department has, since 2017, enforced implementation of Integrated Vector Management strategies for prevention and control of dengue and strengthened Inter-sectoral coordination by actively roping in the urban local bodies (ULBs), department of Urban Development & Municipal Affairs, Panchayat & Rural Development, Animal Resource, School Education, Public Health Engineering, Women and Child Development and Social Welfare led by the District Magistrate at the district level. Weekly house visits to check for vector breeding and fever surveillance followed by prompt treatment and vector control measures as applicable have been the key features for dengue prevention and control activities in the State.

Other infectious diseases: India, Bangladesh, Nepal and Bhutan reported 2822, 97, 185 and 1 cases of kala-azar respectively in 2019. India and Bangladesh still have 90 and 16 endemic kala-azar blocks respectively while Nepal was able to achieve the elimination target in the year 2018. The West Bengal State Health department has, since 2017, enforced implementation of Integrated Vector Management strategies for prevention and control of dengue and strengthened Inter-sectoral coordination by actively roping in the urban local bodies (ULBs), department of Urban Development & Municipal Affairs, Panchayat & Rural Development, Animal Resource, School Education, Public Health Engineering, Women and Child Development and Social Welfare led by the District Magistrate at the district level. Weekly house visits to check for vector breeding and fever surveillance followed by prompt treatment and vector control measures as applicable have been the key features for dengue prevention and control activities in the State.

JE & acute encephalitis syndrome (AES): India, Bangladesh, Nepal and Bhutan reported 2496, 86, 71 and 0 cases of JE respectively in 2019. These countries are endemic and high risk for JE and have been reporting cases since many years. Many outbreaks of JE have been reported from India and Nepal. JE vaccination has been incorporated in the routine immunisation programme in India only in select endemic States including West Bengal and in Nepal nationally. Ten districts each of West Bengal including Darjeeling, Jalpaiguri (including the newly formed Alipurduar district) and Assam and 15 districts of Bihar are high priority districts for JE in India. Outbreaks of JE have been reported in Bankura, Burdwan, Darjeeling and Jalpaiguri districts of West Bengal. The JE cases in the five districts and the State as a whole, however, show a declining trend from 2018 till 2020 (Table 1).

Children and adults were vaccinated against JE in the years 2013-14 and 2015-2016 respectively. Routine JE vaccination for infants was also started from 2013-2014 in all the districts of North Bengal. Incidence of JE in Uttar Pradesh was also reported to have come down appreciably after the JE vaccination campaigns and introduction of JE vaccine under routine immunisation; similar benefits are evident in this State as well.

Scrub typhus (ST): Numerous outbreaks of ST across India and two outbreaks each from Nepal and Bhutan were reported since 2000. Bangladesh is yet to report any outbreak of ST. Among India, Bangladesh, Nepal and Bhutan, only Bhutan has declared ST as a notifiable disease so far. Community and hospital based serosurveillance reports are available from these four countries providing evidence of endemicity of ST. Similar reports are also available for Assam and Bihar.
West Bengal State Health Department commissioned 15 sentinel sites in March 2019 to screen all cases of AES and acute febrile illnesses (AFIs) using ST ELISA based IgM kits. Management protocols for ST were issued in September 2019. Studies from Gorakhpur (Uttar Pradesh) and Assam to determine non-JE aetiologies of AES found antibodies against Orientia tsutsugamushi in 62.7 per cent and 20.3 per cent of the cases respectively. The case fatality ratios (CFRs) in the studies from Assam and at North Bengal Medical College & Hospital, Siliguri, (NBMCH) in West Bengal, India showed high CFRs of 32.7 per cent and 49 per cent, respectively.

Another such study from the northern part of West Bengal, jointly conducted by the State Health department and National Institute of Mental Health & Neurosciences (NIMHANS) at NBMCH, Burdwan Medical College & Hospital (BMCH), Burdwan, and Bankura Sammeleni Medical College & Hospital (BSMCH), Bankura showed a seropositivity of 36 per cent and 49 per cent, respectively.

A community based study among febrile persons in Gorakhpur showed a seropositivity of 19.7 per cent against Orientia tsutsugamushi. Reports on annual incidence of ST in the five North Bengal districts and the total incidence in the State were obtained from 2018 to 2020. Personal communications of the physicians at Mirik Rural and Kurseong sub-divisional hospitals in Darjeeling district on estimated incidence of clinical ST cases encountered and managed revealed more than 200 cases annually from 2018 to 2020. Data on ST obtained from the State Health Directorate for years 2018, 2019 and 2020 indicate a gradual increase in the number of ST cases in the district of North Bengal with more than six and four fold rise in total case load in the State in the years 2019 and 2020 respectively compared to the year 2018 (Table II). The estimated number of clinical ST cases encountered by the physicians at Mirik Rural and Kurseong sub-divisional hospital in Darjeeling district in the years 2018 to 2020 was more than 8 times than that reported by the district annually in those years.

The presence of dedicated national programmes for prevention and control of malaria, JE, dengue and kala-azar as also the presence of orders of the West Bengal State Health department declaring them as notifiable diseases along with the presence of structured mechanisms for early detection, comprehensive data capture of cases and their timely management as per the laid down national protocols and State’s initiatives have all led to better prevention and control of these enlisted diseases in the State. However, there are certain concerns with regards to dengue and ST.

Though only two outbreaks of NiV have been encountered in West Bengal so far with 71 confirmed cases, the occurrence of numerous NiV outbreaks year after year in neighbouring Bangladesh, makes it imperative that surveillance for NiV infection be strengthened, sero-surveys be carried out in the bordering districts amongst the fruit eating bats and other potential vertebrate hosts in the region and spread awareness about the disease and safeguards while harvesting date palm saps.

The initiatives of the State have indubitably led to a decline in the number of JE cases in the North
The decrease in JE is likely due to the JE vaccination campaigns and its introduction under routine immunisation, which has been seen in Uttar Pradesh (UP) as well.38

Scrub typhus has re-emerged and is brazenly challenging the public health professionals with newer and varied clinical presentations, elusive epidemiology and its expansion and presence in areas not known for its endemicity51. The recent years has seen an increase in the number of cases of ST in the entire State including the North Bengal districts which possibly is due to enhanced awareness of ST as an important cause of AES and AFI among the medical practitioners52. The large number of reported outbreaks of AES and AFIs over the last decade, coupled with the increased access to testing facilities for ST in at least tertiary level hospitals has contributed substantially to an enhanced awareness amongst all stakeholders. Poor surveillance for ST with near absence of a system to send all clinical samples for testing are likely factors contributing to the morbidity and mortality caused by the disease especially in Kurseong sub-division of Darjeeling district. The woefully wanting situation has been additionally impacted by the ongoing COVID-19 pandemic, which has further crippled the situation. Delayed hospitalisation of ST cases with multiple organ dysfunctions due to diagnostic dilemmas or lack of clinical suspicion and high mortality of these cases have been widely reported45,49.

More such epidemiological, entomological, and serosurveillance studies are required to identify the local risk factors, the predominant vertebrate hosts and vector mites and the endemicity of O. tsutsugamushi to help plan appropriate interventional strategies involving different non-health sectors including animal resource, agriculture, irrigation, forest, environment departments, etc. to control ST under the “One Health” concept. Enrolment of the Armed Forces for taking a lead in the effective management and establishment of a surveillance system in the affected area, at this crucial juncture, cannot be overemphasized. The Armed Forces Medical College (AFMC), Pune, India has been in the forefront of rickettsial research especially ST for the past 70 yrs with a live trombiculid mite colony to boast. Their expertise in training personnel for rickettsial survey, vector studies and identification, evaluation of various preventive modalities and outbreak investigations is well recognized. The enormous presence of Armed Forces in this border area exhorts their enhanced cooperation by sharing their expertise in formulation of area specific strategies, innovative preventive modalities and targeted recommendations for the effective containment of ST.

It is pertinent to highlight that a majority of the clinically suspected ST cases in the hospitals at Mirik and Kurseong did not have any laboratory confirmation to confidently assert that the recorded ST cases were true ST cases. However, as the hospitals at Mirik and Kurseong have been encountering cases of ST regularly since 2004, and the healthcare providers are well versed in detecting these cases with or without the pathognomonic eschar in the backdrop of negative tests for malaria, typhoid and dengue and the fact that all the suspected cases promptly responded to the empirical treatment with doxycycline/azithromycin as

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| District     | 2018 | 2019 | 2020 |
|--------------|------|------|------|
|              | # ST | # ST deaths | # ST | # ST deaths | # ST | # ST deaths |
| Alipurduar   | 15   | 2     | 13   | 0     | 17   | 0           |
| Cooch Behar  | 5    | 1     | 28   | 1     | 17   | 1           |
| Darjeeling   | 19   | 3     | 21   | 0     | 23   | 0           |
| Kalimpong    | 0    | 0     | 1    | 0     | 3    | 0           |
| Jalpaiguri   | 10   | 2     | 27   | 2     | 21   | 2           |
| Total        | 49   | 8     | 90   | 3     | 81   | 3           |
| State        | 579  | NA    | 3148 | NA    | 2002 | NA          |

Source: State Public Health wing of the Directorate of Health Services, Department of Health & Family Welfare, Government of West Bengal (personal communication)
per the Government of India and State guidelines, left no room for doubt regarding the diagnosis of ST.

On the basis of extensive review of published literature, documents and records on ST and related topics, the following recommendations are put forth: 

(i) awareness to be increased on ST being an important cause for AES and AFI in the region and capacity building of the healthcare providers on early detection and management of ST; 
(ii) use of empirical treatment of clinically suspected ST cases with doxycycline/azithromycin, as applicable, to prevent delayed treatment and complications prior to laboratory confirmation; 
(iii) promotion of personal protective measures including avoiding woods/forests/shrubs, wearing protective clothing and gumboots to work, use of mite repellents and insecticide treated clothes during work, avoiding sitting on grass or shrubs, bathing after work and changing clothes, rearing cattle away from home, avoiding close contact with peri-domestic animals and strict avoidance of open-air defecation; 
(iv) Institution of rodent control measures and proper disposal of dead rodents; 
(v) The State Health department may consider the following: 

a) providing facilities for Weil-Felix test (which is not cost intensive) for confirmation of ST in the primary and secondary tier hospitals in the high risk areas, which have no ELISA facility for IgM testing. This would help early confirmation of ST cases and early referral of complicated cases 

b) issuing of order declaring ST as a notifiable disease so that there is a comprehensive capture of data on ST to help understand the true burden of the disease and plan appropriate public health action 

c) strengthening disease surveillance (case based reporting, reporting of all cases – lab confirmed as well as clinically suspected cases and efforts to get all suspected cases tested for confirmation) in the region given its strategic location, the heavy population movement and it being a tourist destination, business hub and gateway to the North Eastern States of the country 

d) Undertaking epidemiological, entomological, and sero-surveillance studies in different parts of the State to identify the local risk factors, the predominant vertebrate hosts and vector mites and the endemcity of *O. tsutsugamushi* to help plan appropriate interventinoal strategies involving different non-health sectors to prevent and control ST.

### Conclusion

The northern districts of West Bengal are known endemic areas for many outbreak prone communicable diseases like malaria, JE, ST, dengue, and kala-azar. Amongst these, malaria, JE and kala-azar are well in control, whereas dengue and ST are showing an upward trend. The risk of NiV infection too remains and so heightened surveillance for it is required. Multi-sectoral initiatives with emphasis on understanding the complex and rapidly evolving human-animal-vector dynamics as envisaged under the ‘One Health’ concept are indubitably important pillars in the effective management of these emerging public health challenges and necessitate prioritization.

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