

Laboratory and field observations in emergency relief work in a city in Eastern India

Sayan Bhattacharyya¹, Bibhas Nandy², Ramesh Chandra³, Papiya Das⁴

From, ¹Assistant Professor, Department of Microbiology, ⁴Public Health Specialist, Urban Health Unit And Training Centre, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, ²Additional Director, CIRDC, ³Assistant Professor, Department of Community Medicine, National Centre for Disease Control, New Delhi, India.

Correspondence to: Dr. Sayan Bhattacharyya, Department of Microbiology, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India. E-mail: sayantheboss@yahoo.co.in

Received - 12 January 2020

Initial Review - 18 January 2020

Accepted - 24 January 2020

ABSTRACT

Microbiology laboratories must be well prepared to tackle outbreaks in disasters such as waterlogging and flood. Laboratories must be well equipped and prepared to identify the diseases such as dengue and other arboviral diseases, diarrhea, and skin infections. We, as a central team, assessed the laboratory preparedness in a city affected by flood and waterlogging by personal visits and records. It was noted that referral and other government laboratories were performing the recommended tests for arboviral diseases, along with tests for leptospirosis and scrub typhus. We conclude that an all-round effort by multidisciplinary workers with money and adequate workforce is required for early and proper laboratory diagnosis of infections in such scenario.

Key words: *Dengue, Diarrhea, Skin diseases, Waterlogging*

Flooding or waterlogging in both urban and rural areas increases the risk of water-related diseases such as cholera and diarrhea and vector-borne diseases such as malaria, dengue and dengue hemorrhagic fever, yellow fever, and West Nile fever [1-3]. It is seen that waterborne diseases such as diarrhea and skin infections are reported earliest followed by rodent-borne infections such as leptospirosis and then by vector-borne infections [4]. Despite being reported in the early stages of flood, diarrhea dermatitis, conjunctivitis, and ear and nose infections do not lead to epidemics. However, leptospirosis can reach epidemic proportions in floods [3]. These are public health emergencies that warrant swift action from all stakeholders. Laboratories must be prepared to tackle such emergencies. The essential duties of a microbiology department in disasters such as floods and earthquakes are to set up camps, spruce up diagnostic facilities for early case detection duties, and likewise [2]. Hence, it is imperative to assess the preparedness of microbiology laboratories in areas where people are affected by flooding or waterlogging.

Two central health teams visited Patna city and rural area of Bihar state in India, in October 2019, for 12 days, to address the issue of laboratory readiness to tackle this situation in an area having waterlogging due to heavy rain. There was an unprecedented total rainfall of 300 mm between September 27 and 29, 2019, in the city and its suburbs. Following the rainfall, there was large-scale waterlogging due to inefficient drainage in many localities which lead to an upsurge in cases of skin infections, fever with body ache, and acute diarrhea. To monitor the relief work, control measures, and laboratory preparedness, two central health teams, each

comprising a clinician, public health specialist, microbiologist, and an entomologist, were deployed from the Ministry of Health and Family Welfare, Government of India. On visiting the city and its suburbs, the team conducted a house-to-house survey for clinical cases, chlorination, and entomological assessment and also visited nearby primary health center laboratories, sub-divisional hospital laboratories, tertiary laboratories, and referral laboratories. Teams also distributed medicines free of cost as required to the inmates.

Diagnostic services were offered by laboratories of two medical colleges and one research institute. The teams also visited a sub-divisional hospital laboratory, a primary health center laboratory, and a tertiary care medical college laboratory as the patients visit these centers for febrile conditions from affected areas. In addition to this, the microbiologists in the teams performed tests on corporation supply water, tube well water, and bore well water by National Centre for Disease Control-hydrogen sulfide (H₂S) kit which was then incubated at room temperature for 24 h. Water was also tested for chlorination by chloroscope using ortho-toluidine. Instructions were given to the nursing staff in medical colleges and training centers collection of water sample in H₂S test kit bottle. In addition to this, the laboratories were instructed to test random water samples from the city water supply and check for coliforms by direct plate method, to detect coliforms in drinking water.

OBSERVATIONS

Fever with body ache and tinea (ringworm)-like skin lesions was most commonly noted in house-to-house visit followed by few

cases of diarrhea. It was observed that most laboratories had basic diagnostic facilities for diagnosing dengue and other arboviral diseases except the sub-divisional hospital laboratory and primary health center laboratory that referred the patients to higher centers (Fig. 1). Health camps were organized by the referral laboratories for free screening of dengue infections. We noted that the sub-divisional laboratory was performing card test for non-structural antigen 1 for suspected cases, yet they referred the patients to higher center for confirmation.

Primary health center laboratories and sub-divisional laboratories were also doing rapid tests by kits for kala-azar and malaria. Febrile cases with complications such as spontaneous bleeding, melena, and low platelet count were being admitted in two of these centers which had a sizeable indoor facility. Biomedical waste management was proper in all laboratories. There were needle cutters in all laboratories, and diagnostic kits were adequate in the laboratories. However, none of them had a display of handwashing steps or biohazard symbols inside or outside the laboratory (Table 1).

Of the 29 water samples tested, eight were positive with coliforms, of which five were positive for *Escherichia coli*. Diarrheal cases were being reported from areas, where *E. coli* was found in drinking water. Chloroscope showed that all samples had no or negligible residual chlorine level. None of the H₂S kit bottles showed any blackening of its contents after 24 h. Water



Figure 1: Enzyme-linked immunosorbent assay facility to detect arboviral diseases

was tested for coliforms from the same sources. Of the ten skin lesion cases encountered, six were clinically highly suspicious of ringworm (Fig. 2). In the study, a total of 1630 cases were positive for dengue which was detected by enzyme-linked immunosorbent assay immunoglobulin M for dengue in the city from all tested serum samples followed by 90 reported cases of chikungunya. Combination of dengue and chikungunya infection was noted in two cases. There were no confirmed deaths due to dengue in this period of time.

DISCUSSION

Floods are very common disasters worldwide [4]. Flooding or waterlogging is associated with an increased risk of infections, but this risk is less unless there is a significant population displacement or drinking water sources are compromised. Of the 14 major floods which were reported worldwide between 1970 and 1994, only one led to a major diarrheal disease outbreak, in Sudan, in 1980 [3]. This was probably because the flood was further complicated by huge population displacement. To tackle the medical emergencies and screen patients affected in the flood in the city of Patna and suburban areas, government disaster response teams were also deployed along with the central medical team [5]. Many areas of the city were submerged and many people were stranded in their homes.

In our observation, dengue cases were seen after 8 days of start of waterlogging, possibly because there was some preexisting collection of water in containers from beforehand also, due to the monsoons. An important observation by the team this time was that tests of drinking water samples by plate method for coliforms and H₂S kit could be a good simple option, along with laboratory visits. However, the need of a simple and precise field test kit to detect both coliforms and H₂S producers in drinking water was felt. Our study also revealed that microbiologists can really play a key role in ensuring the proper running of existing diagnostic facilities, both in laboratory and field, in such public health emergencies. In such situations, a good liaison between the laboratory personnel and among the laboratories ensures proper biosafety standards [6]. Laboratory people can test water, train staff, and monitor available diagnostic services. Measures, such

Table 1: Readiness of laboratories

Laboratory name/category	Dengue serology	Non-structural antigen 1 card kit	Serology for chikungunya	For leptospirosis	For scrub typhus
Sub-divisional hospital	Not available	Available	Not available	Not available	Not available
Medical college	Available	Done by ELISA	Available	Available	Not available
Tertiary care PG medical college	Available	Done by ELISA	Available	Available	Available
Research institute	Available	Done by ELISA	Available	Available (done for dengue and chikungunya seronegative samples)	Available
Urban primary health center	Not available	Not available	Not available	Not available	Not available

ELISA: Enzyme-linked immunosorbent assay



Figure 2: Tinea-like lesion noted in a patient

as display of biohazard symbol and handwashing steps in or outside laboratories, aid in better infection control in these settings. Diagnosis can be improved with such measures and control measures can be initiated better. Further studies are needed in this aspect.

CONCLUSION

In this part of the country, fever due to vector-borne arboviral diseases, acute diarrheal diseases, and ringworm infections seems to be common after flooding. A holistic concerned approach of microbiologists along with clinician, public health specialist, and entomologist is needed to tackle and manage the health hazards

posed by floods and other calamities. Laboratory preparedness is crucial in this aspect.

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Funding: None; Conflict of Interest: None Stated.

How to cite this article: Bhattacharyya S, Nandy B, Chandra R, Das P. Laboratory and field observations in emergency relief work in a city in Eastern India. *East J Med Sci.* 2020;5(1):1-3.

Doi: 10.32677/EJMS.2020.v05.i01.001