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**Human Communicable Disease Surveillance with Special Focus
on Preparedness and Response for Epidemic Prone Diseases**

Submitted by India

Introduction

1. India believes that an effective and efficient disease surveillance system is crucial for detecting cases of alleged use of biological weapons or suspicious outbreaks of diseases. Systems and mechanisms for surveillance and combating outbreaks of infectious diseases remain the same, irrespective of whether the outbreak is a result of natural causes or a outcome of a deliberate use of biological weapons.
2. With change in epidemiological profile of infectious diseases, emerging and re-emerging infectious diseases, with a high epidemic potential, are now posing a new challenge to public health. Epidemics of communicable diseases with associated enhanced morbidity and mortality are regarded as public health emergencies. Epidemics with increasing severity are being reported in recent years, due to various factors like migration, unplanned urbanization, ecological changes, and emergence of drug resistant strains. Bio-terrorism also poses a new threat. Surveillance is the key to early detection of disease outbreaks and for rapid and effective response.
3. In 1997 the Government of India launched a pilot project - National Surveillance Programme for Communicable Diseases (NSPCD). Complementing the NSPCD is the specialized surveillance being carried out by the institutions of the Indian Council of Medical Research (ICMR).

Disease Surveillance

National Surveillance Programme for Communicable Diseases (NSPCD)

4. NSPCD aims at strengthening the disease surveillance system to enable recognition of the early warning signals of outbreaks of epidemic-prone communicable diseases and initiation of appropriate timely follow-up action through capacity building at district and state levels. The programme, being implemented through the existing health infrastructure in the States and Union Territories, has strengthened the surveillance system through training of medical and para-medical personnel, up-gradation of laboratories, communication and data processing systems. Laboratories at district, state and regional level have been identified and strengthened for carrying out routine surveillance of important communicable diseases and responding to needs during outbreaks. Presently, a total of 101 districts from all States and Union territories are covered under the programme.

5. The Central Bureau of Health Intelligence (CBHI), within the Directorate General of Health Services in the Ministry of Health and Family Welfare, functions as the nodal agency for data collection and documentation on a monthly basis for communicable and non-communicable diseases. This system of disease reporting, with scope for updating and modernization, provides information on disease trends, and relevant statistics. However, it has limitations in that it does not fulfil all the required surveillance needs; the data may need validation and delays are encountered. This system is supplemented by independent effective surveillance activities under various National Health Programmes, such as for control of Vector Borne Diseases, TB, AIDS, elimination of Leprosy and eradication of Poliomyelitis.

6. The Government of India is considering the enactment of a new Public Health Emergencies Act. It covers epidemic prone diseases, health consequences of disasters and bio-terrorism and will have provision for empowering the centre and state governments to declare such conditions and take appropriate measures. As part of the measures to strengthen the capability for meeting the challenge of emerging and re-emerging diseases such as SARS and Avian Influenza, India has strengthened bio-safety and bio-security of the laboratories especially at national level and bio-safety level-3 laboratories are being set up. A special cell to deal with public health aspects of bio-terrorism is also being established at National Institute of Communicable Diseases (NICD).

Specialized surveillance

7. The Indian Council of Medical Research (ICMR) is an autonomous apex organization for conduct of biomedical research within the Ministry of Health & Family Welfare. It has a network of 26 Institutes and close to eighty field stations spread in various states of the country. Majority of the Institutes are disease specific and, by virtue of their experience and expertise, qualify as National Referral Laboratories. In recognition of their excellence some institutes have been designated as WHO Collaborating Centres (National Institute of Virology, Pune for arboviruses and National Institute of Cholera and Enteric Diseases, Kolkata for *V. cholerae* and other diarrhoeal diseases) or International Centre of Excellence in Research & Development (Tuberculosis Research Centre, Chennai for TB) or Global Specialized Laboratory for Polio (Enterovirus Research Centre, Mumbai). These Centres conduct specialized surveillance using state-of-the-art tools and

technologies of modern biology like polymerase chain reaction, micro-array technology, DNA sequencing, bio-informatics etc. The information and data generated through this surveillance feeds into the NCDSF.

8. Some examples of the specialized surveillance are:

- (i) **Surveillance for Drug Resistance:** For example surveillance for drug resistant tuberculosis, malaria, *V. Cholerae*, *Shigella dysenteriae*, *N. gonorrhoea* etc. These strains are characterized and finger-printed;
- (ii) **Influenza Surveillance:** The National Institute of Virology, Pune has been functioning as a WHO National Influenza Centre since 1976. It has isolated more than 400 influenza viruses having 40 antigenic variants. It has been contributing strains to the WHO Collaborating Centre at CDC, Atlanta;
- (iii) **Surveillance for diarrhoeal diseases:** A hospital based surveillance for diarrhoeal diseases is being continued at Infectious Diseases Hospital, Kolkata. It has been from here that new diarrhoea causing pathogens have been identified, for example *V. Cholerae 0139*, *V. parahaemolyticus 03 : K6*, Gp B Adult Diarrhoea Rota virus etc.;
- (iv) **Surveillance for resistance to insecticides in Vectors:** This is being done for vectors of malaria, leishmaniasis, filariasis, Japanese encephalitis, dengue etc. Genetic finger-printing of the strains is being maintained as a data-base;
- (v) **Surveillance for wild polioviruses:** India is in the midst of an end-stage effort eradicate polio from the country. In the surveillance for wild polioviruses in cases of acute flaccid paralysis it is not enough to know whether the isolates are of poliovirus 1, 2 or 3. It is important to know the lineage and the source of the strain. For this, fingerprinting of the isolates is done and dendrograms are prepared. This data indicates the place and the type of intervention that is needed. In addition, environmental sampling of Mumbai sewage is conducted all the year round to detect circulation of wild polio viruses in absence of cases.

9. The Institutes of the ICMR also produce diagnostic tests for infectious diseases. For example ELISA based test kits have been developed for antigen detection (Hepatitis B, rota virus) and IgM antibody detection (Japanese encephalitis, dengue, West Nile, Hepatitis A and Measles virus). PCR based test have been developed for Hepatitis B, C and E viruses. Some of these tests are made available for surveillance activities in the country (like ELISA for JE, DEN and WN). Test reagents were also developed for *V.cholerae 0139*, when it spread around the world 1993-94.

Early warning system

10. Using remote sensing images from satellite and data generated through geographical information system, technology has been developed by Institutes of the ICMR for forecasting and development of malariogenic conditions for impending epidemics. Similarly an early warning system using sentinel animals has been developed for Japanese encephalitis.

Outbreak investigations

11. Under the Constitution of India, health is a state subject and investigation of outbreaks is the responsibility of State Governments. It may call for assistance, technical or otherwise, from the Central Agencies. Generally, the first port of call is the National Institute of Communicable Diseases (NICD), Delhi. The Institutes of the ICMR are called in to investigate when needed.

12. The expertise and infrastructure available within the network of ICMR Institutes is a national resource for investigating a suspicious outbreak or that of unknown etiology. The vast network ensures a response in the shortest period of time in any part of the country. Each Institute has been provided with bio-hazard containers for collection and transport of biological specimens for investigations. The details of method of collection, the type of specimen, quantity, storage conditions and where and how to ship it to an identified laboratory have been provided. The ICMR Institutes have been identified as nodal centres for specific micro-organisms and toxins. These centres have developed Standard Operating Procedures (SOPs) for handling the biological specimens and their processing. They are equipped in conventional and modern biology tools and technologies. Most of the Institutes have a Bio-safety level-2 laboratory. A new Microbial Containment Complex with BSL-3 facilities is scheduled to be commissioned in August, 2004. In case need arises, the use of BSL-4 level facilities, which have been set-up for plant and animal pathogens, is also possible.

Microbial Repositories

13. A large number of strains of micro-organisms are available in the repositories which have been characterized and finger printed by ICMR. These provide a valuable resource for comparative studies when new or modified strains are isolated. Repositories have been set-up for etiological agents of Malaria, Tuberculosis, HIV, Leishmaniasis, Cholera, arboviruses and hepatitis etc.

New and emerging infections

14. The Institutes of the ICMR are equipped to investigate and detect new infections. The SARS infection was picked up first in the country by an ICMR laboratory. Similarly, outbreaks were identified to be caused by Enterohaemorrhagic *Esch. Coli* O157:H7, Influenza A (H3N2), Nipah virus, Chandipura virus (belonging to family *Rhabdoviridae*) etc.

Outbreak response

15. The outbreak response at the Central level is coordinated by the NICD, Delhi. Operational in 101 districts, this programme has achieved: improved quality of detection, investigations and timely response to outbreaks, improved capability of laboratories for etiological diagnosis, rapid transmission of information through web-based surveillance and feedback through weekly Outbreak News & monthly Communicable Disease Alert (CD Alert).

16. Rapid Response Teams (RRT) to deal with epidemic situations at States and district levels, with requisite knowledge and skills, have been set up. RRTs are multi-specialty teams consisting of experts in the field of public health, microbiology, clinical medicine and entomology. The team members have been provided with the requisite skill and technical guidelines to respond to

emergencies. During the year 2003, more than 100 outbreaks were timely detected and effectively controlled by RRTs based at the district level.

17. India has gained valuable experience in managing various outbreaks of communicable diseases, some of which had global implications. The SARS outbreak of 2003 highlighted the effective role of national authorities in combating the threat. The control over spread SARS in India was achieved by prompt detection and isolation of cases, good infection control in hospitals, tracing and quarantine of contacts and effective laboratory support. Various steps initiated following the global alert of SARS included screening of all international passengers and crew at all airports/ports through a specially designed proforma, strengthening of health care facilities at ports and airports, facilities for treatment in isolations in the identified hospitals of all the states of the country, provision of personal protective measures to health care workers, preparation and distribution of communication package for mass awareness for health workers and community including daily monitoring and transparency in handling media. As envisaged in the draft International Health Regulations, the Indian Government plans to review the core capacity requirements for public health response.

18. ICMR also collaborates in providing epidemiological and laboratory support services during outbreak situations through its specialized laboratories like National Institute of Virology (NIV), Pune, National Institute of Cholera and Enteric Diseases (NICED), Kolkata, and Vector Control Research Centre (VCRC), Pondicherry etc.

International cooperation

19. Establishment of a Coordination Centre for Disease Surveillance and Rapid Deployment at NICD, Pune, for the countries of the South Asian Association for Regional Cooperation (SAARC) is under active consideration of India and the SAARC Secretariat. During the recent outbreak of avian influenza, the Health Secretaries of SAARC countries met at New Delhi to review and coordinate their response strategies. The issue of cross-border transmission of the diseases with special focus on HIV/AIDS, Malaria, Tuberculosis, Poliomyelitis and Kala-azar is also being tackled through bilateral and international collaboration.

Integrated Diseases Surveillance Programme (IDSP)

20. India plans to launch a decentralized and State based Integrated Diseases Surveillance Programme (IDSP) as the backbone of public health delivery system. The programme aims to:

- (i) Establish a system of surveillance for communicable and non-communicable disease and their risk factors for timely and effective public health actions;
- (ii) Improve the efficiency of the existing surveillance component of disease surveillance programme; and
- (iii) Facilitate sharing of relevant information with the concerned stake-holders to detect disease and risk factor trends over time and evaluate control strategies.

Conclusion

21. Surveillance is the backbone for early detection and rapid response to disease outbreaks. The existing system of surveillance with special focus on early detection and response is being further strengthened and modernized to meet the challenges of emerging and re-emerging infections, including the threat of bio-terrorism. The Government envisages covering the whole country under the Integrated Disease Surveillance Programme in a phased manner with emphasis on strengthening laboratory and rapid response capabilities. The optimal utilization of existing strengths and resources and further strengthening and broadening the national and international institutional collaboration for surveillance can mitigate to a large extent mortality, morbidity and economic loss due to disease outbreaks.

22. India has the institutional infrastructure and technological capability for the surveillance, detection, diagnosis and combating of infectious diseases affecting humans, animals and plants. India also has national capability for responding to, investigating and mitigating the effects of cases of alleged use of biological or toxin weapons or suspicious outbreak of disease.
