REVIEW ARTICLE

Public health emergencies in urban India

Bhabani Prasad Acharya[1], Roy Arokiam Daniel[2], Baridalyne Nongkynrih [3], Sanjeev Kumar Gupta[3]

[1,2]Resident, [3]Professor, Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi

Abstract | Introduction | Methodology | Results | Conclusion | References | Citation | Tables / Figures

Corresponding Author

Address for Correspondence: Dr. Baridalyne Nongkynrih, Professor, Centre for Community Medicine, All India Institute of Medical Sciences, Ansari Nagar, New Delhi – 110029
E Mail ID: baridalyne@gmail.com

Citation

Acharya BP, Daniel RA, Nongkynrih B, Gupta SK. Public health emergencies in urban India. Indian J Comm Health. 2018; 30, 1: 18-23.

Source of Funding: Nil **Conflict of Interest:** None declared

Article Cycle

Received: 11/11/2017; **Revision:** 05/01/2018; **Accepted:** 03/03/2018; **Published:** 31/03/2018

Abstract

Public health emergencies in urban India can be caused by natural or man-made disasters. Occurrence of a public health emergency adds to the already stretched health system. This paper looks into the public health emergency conditions in urban India, and our preparedness to tackle them. To address this composite threat to nation's health and development, a concerted public health response is needed, that can ensure efficient delivery in emergency situations

Public health emergency is an occurrence or eminent threat of an illness or health condition caused by bio-terrorism, epidemic or pandemic disease, or novel and highly fatal infectious agent or biological toxin, that possess a substantial risk of a significant number of human facilities or incidents or permanent or long–term disability (1). It is a condition that requires the government to declare a state of public health emergency. The declaration of a state of public health emergency permits the government to suspend state regulations,and change the functions of state agencies (2).

Term "Urban" refers to perplexing variety of environments. Health circumstances of small cities and town differ in many ways from larger cities and metros. Within cities, change in lifestyle of residents is observed. The urban system is often present with full array of health providers ranging from traditional healer, street drug seller to highly –trained surgeons (3).

Keywords

Public health; Emergency; Urban health; India

Introduction

India is the seventh largest country according to area, while second largest when population size is taken into consideration (4). Though nearly two-third of the population still resides in rural areas, the urbanization of India started soon after independence. This process is now accelerating, mostly due to the country's adoption of mixed economy resulting in opening of the private sector. This can be exemplified by the increase in the number of towns and metropolitan cities from 5161 (2001 census) to 7935 (2011 census) with a rise of 18 new metropolitan cities (+ 1 million population) in the last decade. The rise in growth rate of the urban population has come during an era of a sharp decline in the natural growth rate. This shows that the push to urban population has come in from other sources, i.e., rural to urban conversion and rural-urban migration (5).

India's climate varies from tropical in the south, to temperate and alpine in the Himalayan region in the north. This unique geo-climatic condition makes India vulnerable to various natural disasters, with urban areas in the hot-spot due to rapid urbanization. Natural disasters can often be predicted, and their impact can be reduced significantly. Except natural disasters, all other disasters can be prevented. The increased vulnerability to man-made disasters due to rapid industrialization and probability of terrorist attacks pushed the need to adopt a multidisciplinary and multi-sectorial approach for preparedness, prevention/mitigation strategies and develop capabilities to improve response. The deaths due to man-made disasters were nearly 12 times higher than those caused by natural calamities in between 2001- 2003 with approximately 1,20,000 deaths, and estimated economic loss of ₹ 1,50,000 crores. This establishes the importance of setting up an institutionalized mechanism for medical preparedness across the nation (6)

SOME IMPORTANT PUBLIC HEALTH EMERGENCY OUTBREAKS IN INDIA

Disasters have contributed to some specific public health emergency outbreaks. These occur due to increased risk factors in a particular area, namely, lack of clean water, air pollution, public health program suspension, illnesses such as dengue, cholera, malaria, etc. These factors contribute more to the damage caused than the disaster itself. A rapid change in the human environment and health occurs due to a natural disaster, an act of war or an industrial accident. There is increased chance of man-vector contact in shelter and temporary camps. Viral agents during the time of nuclear, biological and chemical warfare can cause diseases such as anthrax, cholera and plague, which require immediate management and control.

Public health emergencies can be divided into natural and man-made disasters.

NATURAL DISASTERS:

Most natural disasters such as earthquake, flood, landslide, etc., are taken care of by the Ministry of Home Affairs, except drought which is under Ministry of Agriculture. Most notable earthquakes in urban areas occurred in Jabalpur, Madhya Pradesh on 22nd May, 1997 and Bhuj, Gujarat on 26th Jan, 2001(7). Heavy rain causing urban flood was seen in Delhi flood on river bank of Yamuna in 1988; meteorological event in Mumbai on 26th July, 2005 and Chennai Urban flood occurred in Nov-Dec, 2015. Earthquake (6,7).

An earthquake is the most disastrous among all natural calamities. Around 54% of our nation's landmass is prone to earthquake, causing innumerable deaths, massive injuries and destruction. Moreover, it is more disastrous in urban area because of dense population, multistoried buildings, and elderly population residing there (approximately 30%). The impact of an earthquake depends upon its extent, location and time of occurrence. The largest earthquake in India occurred in 1897 in Shillong plateau with magnitude of 8.7. Another incidence with magnitude of 8.6 in Sadiya region on 15th Aug,1950 was so intense that the river changed its direction, and stones were thrown upward with an acceleration exceeding 9.8 m/s2. Most cities in India are in earthquake-prone zones, with Delhi, Mumbai, and the Indo-Gangetic plain in Zone 4. An important aspect in the aftermath of an earthquake is the destruction of road and communication pathway for supply of relief and medical care.

MAN-MADE DISASTERS:

The Bhopal Gas Tragedy in Madhya Pradesh on 2nd Dec, 1984 due to methyl iso-cyanide was an example of man-made disaster, and was a tragedy of epic proportions on human society. This type of chemical disaster is handled by the Ministry of Environment and Forest (8,9). Man-made disasters can be caused due to stampedes, terrorist attacks, collapse of building and fire/burn or road traffic accidents whose nodal agency is the Ministry of Home Affairs. Table 1 shows some notable recent stampede incidents which happened in India

Other man-made rare disasters include air traffic accidents handled by Ministry of Civil Aviation, railway accidents managed by the Ministry of Railways, and nuclear disasters managed by the Ministry of Atomic Energy.

Urban flooding (10,11)

Contrary to rural floods, urban flooding is significantly different. It is because it is a man-made / artificial disaster. Loss of green cover in urban areas has led to decrease in precipitation of rain water into the soil. Urbanization increases the risk of flood up to thrice due encroachment of catchment area. Peak

flows result in flooding very quickly due to faster flow times (in matter of minutes). Large number of people are affected because of dense population clusters. The consequent severe economic and infrastructure loss to industry and commerce mostly affects the vulnerable populations in slum areas and resettlement colonies. Contamination of water supplies and shortage of food lead to various disease outbreaks.

Air pollution: Most recently, air pollution in Delhi reached hazardous levels, and has been considered a public health emergency. According to the recent database of the World Health Organization, levels of ultra-fine particles of less than 2.5 microns (PM2.5) are highest in India, which has 16th of the world's 30 most polluted cities (12). On the morning of 7th November 2017, the air pollution tracker in New Delhi reported that the levels of PM2.5 reached 703, which is over double the mark of 300 that authorities deem as hazardous; a level that leaves even healthy people at risk of serious respiratory problems.

Communicable diseases:

A number of communicable diseases with potential for outbreaks cause enormous loss of human lives and puts stress on health resources in India. SARS in June, 2003, Swine flu (H1N1) in 2009, Dengue and Chikungunya in every rainy season, acute hepatitis in Kollam, Kerala during February to June 2013, Zika virus disease in Bapunagar area, Ahmedabad District, Gujarat in May, 2017 are some examples of outbreaks which occurred in urban areas resulting in public health emergency situations.

Influenza (13): Currently H1N1, H1N2, H3N2 viruses are circulating across countries. Early detection and warning and diagnostic conformation could reduce disease threat. This needs surveillance and rapid confirmation of the disease among suspects by ELISA test. Transparent notification should be done for which "One world One Health" campaign is going on by the World Health Organization, OIE (World organization for Animal Health) (14), FAO, UNICEF organizations. Rapid response is to be undertaken with vaccination, culling of poultry flocks and health education in different mass media.

Zika Virus (15,16): About one in five persons who are infected with Zika virus, becomes ill, i.e., develops Zika disease. Its presentation is a "Dengue like Syndrome". It can cause birth defects linked to Guillain- Barre Syndrome and microcephaly by transplacental route. Prevention strategy includes vector (Aedes mosquito) control measures. recent evidence shows that virus transmission occurs through sexual contact also. Hence apart from vector control measures, abstinence from sexual contact is necessary for those who are returning from Zika endemic region for at least 2 months for females and 6 months for males (17). Serological tests are not recommended, and no curative medication or vaccination is available till date for this. Only supportive care is needed for cases.

Dengue and Chikungunya (18): Dengue is hyper-endemic in urban and semi-urban area of India. Antibodies to dengue virus were found in 0·9–9·9% of chikungunya patients in India, and to both chikungunya virus and dengue virus in 0·4–4·3% of patients. Neither vaccine nor treatment is available for these diseases. NS1 Ag and IgM Ab test is done for Dengue case detection. Similarly, PCR for Chikungunya could be done. However, these tests are too costly and not widely available. Prevention strategy includes vector (Aedes mosquito) control measures only.

NEED FOR DEVELOPING QUALITY EMERGENCY MEDICAL CARE: Public Health Emergency Preparedness (PHEP) is the capability of the public health care system, community and individual to respond to any health emergency; it is a continuous process involving planning, implementation, re-formulation and corrective action plan (11). The responsibility lies on the concerned government agencies, non-governmental organizations, and community residents. It covers a large share of first aid, search, rescue and other initial response to be provided by on-site civilians before the arrival of response personnel.

International framework: Internationally, guidelines are available for preparedness in disasters and public health emergencies. Some of them are:

Yokohama Strategy (1994): This is the output of the World Conference on Natural Disaster Reduction, held in Yokohama, Japan, from 23 May to 27 May 1994. It provides guidelines for natural disaster prevention, preparedness and mitigation (19).

Sendai framework (2015-2030): The Sendai Framework is a fifteen-year, voluntary, non-binding

agreement which recognizes that the primary role of disaster risk reduction lies with the state (20). The four priority themes of the Sendai Framework, are: understanding disaster risk, improving disaster risk governance, investing in disaster risk reduction (through structural and non-structural measures), and disaster preparedness, early warning and building back better in the aftermath of a disaster.

In June 2016, our Prime Minister, Mr. Narendra Modi released the country's first ever National Disaster Management Plan, a document based on the global blueprint for reducing disaster losses, the Sendai Framework for Disaster Risk Reduction (21).

International Health Regulations (2005): As there is an increase in international trade and travel, there is increased chance of emergence and re-emergence of diseases. To address this issue, 196 counties signed the regulations on 15th June 2007. It requires states to strengthen the surveillance and response at primary, secondary, national and international level in ports, airports and ground crossings to prevent protect, control and provide public health response against disease outbreak (2).

Emergency preparedness in India: India has a legal framework in place for addressing various situations of public health emergencies, e.g., Epidemic disease act 1897, Municipal act, Water/Air Act, Biological Weapons Convention, 1972, Environmental Pollution Act, 1986, National Disaster Management Act, 2005, Draft of Public Health Act (20). The institutional framework for preparedness and response of disaster management institutions from national to local level in India is shown in Figure 1 (22)

QUALITY EMERGENCY MEDICAL CARE IN INDIA

The primary goals of any health care service are improvement of health of the population, responsiveness to felt needs of the people, and financial protection against costs of ill-health.

Quality of care is a multidimensional concept consisting of objective and subjective elements. This includes Health enhancing aspect (Technical quality), Responsive dimension (Interpersonal quality of care), Equity (Financial protection) and Social aspect (Efficiency and access) (23).

In India, over 66% of hospitals and 77% of hospital beds and most of the medical colleges are located in urban areas. The Central government has initiated a scheme to enhance and upgrade the accident and emergency services in selected State government hospitals falling in the accident-prone areas of the national highways. Under the **Sanjivani scheme** to provide emergency health care in times of disaster, the central government has acquired container-based mobile hospitals, which can be transported by rail, road or by air, and be set up at or near the disaster site at short notice. Once installed, it would be a hospital with 200 beds with operation theatre and diagnostic facilities including CT scan (24). The **First Referral Health Systems Project** being implemented with support of the World Bank in states such as Andhra Pradesh, Maharashtra, Orissa, Punjab, etc., aims to improve emergency medical services as a key component of the overall health program. The state governments' initiatives to ensure 24-hour availability of staff and provision of telephones at Urban Health Posts are bound to improve access and quality of emergency care.

Focus areas for Quality Emergency Care: The focus areas for emergency care changes constantly with time, place, resource and preparedness. Earlier, the focus was primarily on **Relief and Rescue operation**. It is a temporary and instant measure. Later, the focus shifted to **Disaster Mitigation and Preparedness.** India is currently in this phase.

The ultimate focus should be on **vulnerability risk reduction.** This needs proper planning, expertise, and co-ordination of various organizations and departments. It includes:

a) Linkage of disaster mitigation with development plans, effective communication system, use of latest information technology, extensive public awareness and education campaigns, particularly in the slum areas, legal and legislative support, greater involvement of non-governmental organizations / private sector.

b) Emergency Medical Relief (EMR) division under the Directorate General of Health Services is the technical in wing for the management of crisis situations. It prepares detailed guidelines for flood, drought, cyclone and earthquake. For drought prone areas, the guidelines are circulated in the months of March and April, and in May and June for cyclone and flood prone area. The relevant information of concerned officers at state level are regularly updated. During disasters, the EMR control room remains fully operational round the clock for smooth management.

c) Creation of 24-hour ambulance service, e.g., CATS in Delhi, EMRI in Hyderabad, National Ambulance Service [Phone numbers: 102, 108].

d) Capacity building of doctors and paramedical staff- Regular training of doctors and paramedical staff with structured syllabus for enhancement of trained manpower is a vital step. The Academy of Traumatology, Ahmedabad has introduced the National Trauma Management Course (NTMC). The National Disaster Preparedness Course for Hospitals (NDPCH), and the Basic and Advanced Cardiac Life Support courses (BLS and ACLS) are some of the courses offered in India. In addition to training of health professionals, there have been some efforts to build capacity among the first responders such as policemen, firemen, volunteers and the community to respond to medical emergencies

Conclusion

Public health emergencies which can be mitigated by prompt emergency care only add to the already burdened health system in India. Urban health system in India is dismayingly complex, with private for-profit and non-profit care having significance presence. Currently, our emergency care is in the nascent stage. However, in recent years, there have been some initiatives to improve access and quality of emergency care. The government has to continue to play a lead role with support and collaboration of the multiple stakeholders involved in facilitation of access, financing, development of standards and capacity building for emergency care. Apart from emergency care, plans should be thought for disaster mitigation and prevention. The concerned areas include linkage to development plans, effective communication system with use of latest technology, insurance in relevant sectors, extensive public awareness and education campaign for disaster preparedness, legal and legislative support with involvement of non-governmental organizations and private sectors

References

1. WHO | Definitions: emergencies [Internet]. WHO. [accessed on 4 Sep 2017]. Available from: http://www.who.int/hac/about/definitions/en/
2. WHO. The world health report 1991: making a difference [Internet]. [accessed on 2016 Sep 22]. Available from: http://www.who.int/whr/1999/en/whr99_en.pdf?ua=1
3. Montgomery MR, Urban health in Low- and Middle -income countries. in: Roger Detel et al. 6th ed. Oxford textbook of public health (UK) :Oxford University Press, 2015.(p. 1326)
4. India Climate, Climate Map of India and Climatic Regions Map [Internet]. [accessed on 10 Sep 2017]. Available from: https://www.mapsofindia.com/maps/india/climaticregions.htm
5. Indian's urban demographic transition ;census 2011 [Internet]. [accessed on 2017 Sep 10]. Available from: http://moud.gov.in/upload/whatsnew/59144a0d559cdSOP%20Urban%20flooding_5%20May%202017.pdf
6. National Disaster Management Plan May 2016.pdf [Internet]. [accessed on 15 Sep 2017]. Available from: http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf
7. Bremer R. Policy Development in Disaster Preparedness and Management: Lessons Learned from the January 2001 Earthquake in Gujarat, India. Prehospital Disaster Med. 2003 Dec;18(4):372–84.
8. Broughton E. The Bhopal disaster and its aftermath: a review. Environ Health. 2005 May 10;4(1):6. PubMed PMID: 15882472; PubMed Central PMCID: PMC1142333.[PubMed].
9. Sharma DC. Bhopal: 20 years on. Lancet. 2005 Jan 8-14;365(9454):111-2. PubMed PMID: 15643703.[PubMed].
10. Rafiq F. Urban floods in India [Internet]. [accessed on 16 Oct 2017]. Available from: https://www.ijser.org/researchpaper/Urban-Floods-in-India.pdf
11. Urban Floods - National Disaster Management Authority [Internet]. [accessed on 16 Oct 2017]. Available from: http://www.ndma.gov.in/en/media-public-awareness/disaster/natural-disaster/urban-floods.html
12. WHO Global Urban Ambient Air Pollution Database Update 2016 [Internet]. [accessed on 8 Nov 2017]. Available from http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/
13. Check-List for Central Rapid Response Team for Disease Outbreak Investigation Including Avian Influenza [Internet]. 2008 [accessed on 10 Oct 2017]. Available from: http://www.ncdc.gov.in/checklist.pdf
14. OIE - World Organisation for Animal Health 2016. [accessed on 25 Aug 2017]. Available from: http://www.oie.int/en/animal-health-in-the-world/update-on-avian-influenza/2016/
15. Zika Virus [Internet]. CDC. 2014 [accessed on 25 Aug 2017]. Available from: https://www.cdc.gov/zika/index.html
16. Bloch ARP and EM. A Literature Review of Zika Virus - Volume 22, Number 7—July 2016 - Emerging Infectious Disease journal - CDC. [accessed on 9 Sep 2017]; Available from: https://wwwnc.cdc.gov/eid/article/22/7/15-1990_article
17. Matheron S, d'Ortenzio E, Leparc-Goffart I, Hubert B, de Lamballerie X, Yazdanpanah Y. Long-Lasting Persistence of Zika Virus in Semen. Clin Infect Dis. 2016 Nov 1;63(9):1264. Epub 2016 Jul 28. PubMed PMID: 27470244.[PubMed]
18. Palaniyandi M. The environmental aspects of dengue and chikungunya outbreaks in India: GIS for epidemic control. Int J Mosq Res. 2014;1(2):38–44.
19. Yokohama Strategy and Plan of Action for a Safer World: guidelines for natural disaster prevention, preparedness and mitigation. [accessed on 24 Sep 2017]. Available from https://www.unisdr.org/we/inform/publications/824120.
20. Aitsi-Selmi A, Egawa S, Sasaki H, Wannous C, Murray V. The Sendai Framework for Disaster Risk Reduction: Renewing the Global Commitment to People's Resilience, Health, and Well-being. Int J Disaster Risk Sci. 2015 Jun 1;6(2):164–76.
21. India puts Sendai Framework into operation - UNISDR [Internet]. [accessed on 2017 Sep 24]. Available from: https://www.unisdr.org/archive/49068
22. Patro. Epidemic diseases act 1897, India: Whether sufficient to address the current challenges? [Internet]. Available from: http://www.jmgims.co.in/article.asp?issn=0971-9903;year=2013;volume=18;issue=2;spage=109;epage=111;aulast=Patro

23. Madan A, Routray JK. Institutional framework for preparedness and response of disaster management institutions from national to local level in India with focus on Delhi. Int J Disaster Risk Reduct. 2015 Dec 1;14:545–55.

24. Thota D, George CK. Quality emergency medical care in India: challenges & opportunities. The Institute of Health Systems; 2005. [accessed on 2017 Oct 10] Available from https://www.ihs.org.in/Publications/wp60.pdf.

Tables

TABLE 1 NOTABLE RECENT STAMPEDE INCIDENTS IN INDIA

Event	Date	Casualty
Puttingal Devi Temple, Kollam, Kerala	10th April, 2016	106 deaths; 383 injured
Ratangarh MataDevi Temple, Madhya Pradesh	13th Oct, 2013	115 deaths; 110+ injured
Chaminda Devi Temple, Jodhpur, Rajasthan	30th, Sep 2008	224 deaths; 445+ injured

Figures

FIGURE 1 INSTITUTIONAL FRAMEWORK FOR DISASTER MANAGEMENT INSTITUTIONS IN INDIA

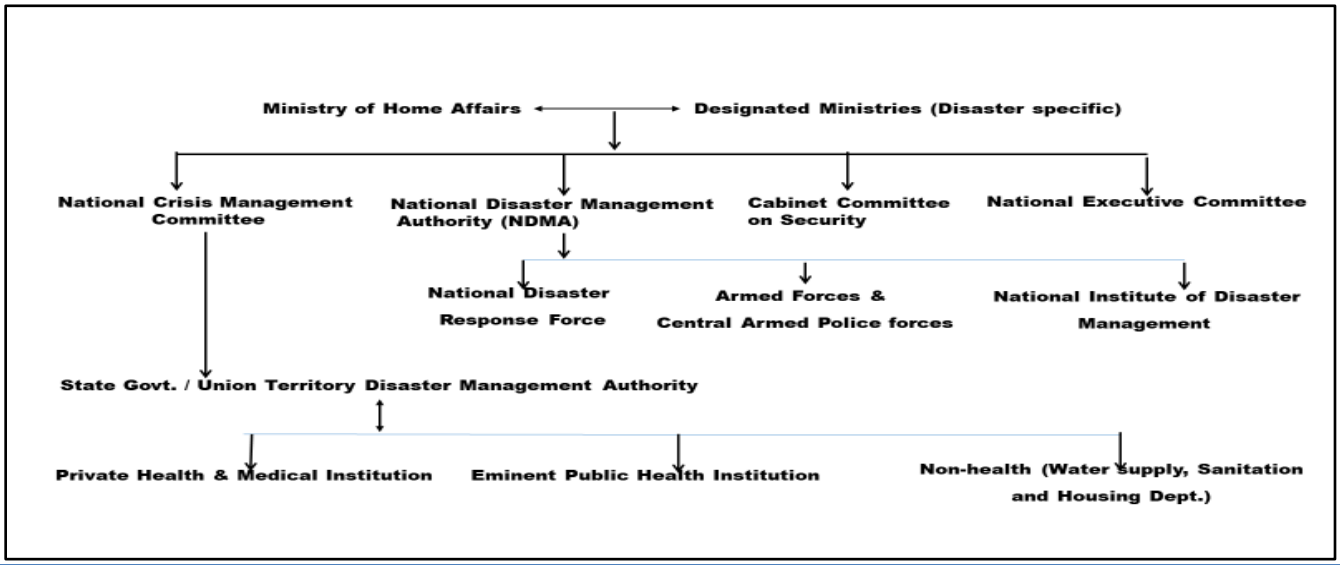

FIGURE 2 PREVENTIVE MEASURES IN EMERGENCY SITUATIONS

Box 1: Preventive measures in emergency situations

Prevention of infectious disease outbreaks:

- Provision of safe drinking water: piped water, halogen/chlorine tablet, boiling of water.
- Proper disposal of waste and human excreta.
- Fly proofing (Regular bleaching powder spray).
- Health education regarding personal hygiene through various media.
- Continuous surveillance of occurrence and trend of disease.
- Immunisation against disease in high risk group.
- Proper disposal of dead bodies by burial method in individual graves after wrapping with plastics when coffin is not available at proper location of graveyard with due consideration to location, ground consideration and groundwater drinking sources. Due respect should be given to cultural and religious practices.
- Provision of adequate nutrition and shelter
- Establishment of treatment center and referral transport service
- Establishing outbreak response team.
- Creation of " National disaster inventory" of essential medical supplies at different strategic location decided by " Critical incident" mapping for delivery within 24 hour in Govt. owned warehouses supported by major pharmaceutical disaster inventory.

Earthquake Prevention strategy

- Administration of strict guidelines for building and construction in earthquake-prone zone.
- Behaviour change Communication activities for damage reduction.
- Increasing trauma centres, and beds for crush injury in other hospital
- Strengthening information technology

Urban flooding prevention strategy

- Proper mapping/zoning of area, estimation of flood damage.
- Establishment of local network for real-time rainfall data.
- Removal of encroachment and preservation of water-bodies.