Resilient Health System for management of climatic and biological disasters in India

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Abstract

Health system plays an important role in strengthening the public health management for people suffering from disasters whether natural or man-made associated with climate or biological change. The problem occurs when a large chunk of the population suffer from various natural hazardous effects such as heat stress, floods, droughts and infectious diseases and so on that has become more frequent in India. Thus, India needs to build a strong resilience health system for effective management of public health during disasters. This research aimed to illustrate the impacts that infectious disease outbreaks such as recent Covid-19 or other natural hazards have on health systems. Health system in the face of infectious disease emergencies and natural hazards highlighting building blocks of the health system and will identify the gap in between plans and policies for sustainable change and their successful implementation. This research article will help us to understand the health system resilience during public health disasters concerning recent pandemic Covid-19 and goal for universal health coverage 2030.

Introduction

India is a country almost entirely prone to vulnerabilities such as floods, droughts, cyclones, earthquakes, landslides, avalanches, tsunamis and forest fires. India is one of the countries highly prone to floods, in 2018, the most common disasters observed were dust storms, Nipah virus outbreak in Kerala and Kerala floods. In 2005, the disaster management act has initiated in just a year after the devastating tsunami in 2004. Disasters Management Authority were made at district, state and national levels with administrative powers and adequate financing. It has given a framework for disaster management. The national policy for disaster management was made in 2009 to manage the disasters in the country with a vision to build a disaster-resilient country by using different strategies at all levels. A disaster-resilient country promotes healthy living at individual, community, hospital, and caregiver's level in disaster or other crises by reducing the risks of mortality, morbidity and epidemics. Hence, the Sendai Framework for Disaster risk reduction 2015-2030 promoting health by integration between disaster and health risk management (Borah M., 2018 (1)). The recent Covid-19 has put uncertainties to public health in India, thus Indian

Central government has been made various approaches to tackle the pandemic. However, the country with a huge population challenging unprepared unstructured health system demands due to stress of emergent Covid-19 cases and deaths.

Climate shocks and disasters - a road to UHC

India is extremely vulnerable to attacks by infectious disease whether climatic or biological. Health system should be well-prepared for shocks. “Shock” is defined as sudden events, whether environmental, climatic or others, that impact the performance of health. Different types of climate-related shocks can strike at different levels, such as disease outbreaks, floods, heatwaves, high winds, landslides, droughts and so on that can impact public health. Severe economic instability could be included because of its effect on the capacity of health systems to manage other stresses (Methodological Guidance, World Bank, 2018(2)).

A healthy environment is a requirement for a healthy population. The optimum contribution of various greenhouse gases maintains the natural ecosystem. But some man-made activities majorly burning of fossil fuels, have resulted in increasing the concentration of these gases which in turn release extra heat and lead to climate change (MOEF, GOI, 2019(3)).

According to the recent survey of 14 countries by IPSOS, found that globally around 71 per cent of adults think through that “climate change is as serious a crisis as COVID-19”, there is a need to prioritize climate change to halt the crisis (Long J., Gordon L., Townend R., 2020(4).

India is witnessing an epidemiological transition communicable to non-communicable diseases. However, under the strong influence of climate change, the Indian population is exposed to various infectious diseases (vector-borne, water-borne, chronic diseases and zoonotic diseases) which are bringing back the concern of communicable diseases (WEF Global Risks report, 2019(5)). Extreme weather events like Floods resulting from monsoon rains turn into vector-borne diseases such as diarrhoeal disease, cholera, dysentery, and typhoid, etc. The rising temperature increases the survival time of bacteria in the water that causes water Borne diseases like cholera and diarrhoeal disease. Increase in temperature and other changes in weather also affect malaria transmission. Further, another vector Borne and zoonotic diseases such as chikungunya fever and dengue also influenced by climate change including temperature and precipitation. India is experiencing numerous human health effects because of climate change resulting in growths in extreme weather events which lead to morbidity and mortality (V. R. Dhara, 2013(6)).

Disasters and Disease Epidemics

Since the year 2001, the Bhuj earthquake, a heatwave in Orissa and a cold wave in Uttaranchal and Uttar Pradesh in 2004, the Indian Ocean Tsunami affected parts of South India in 2004 that killed 10000 people in India, the Kashmir earthquake in 2005, rains and floods in Maharashtra in 2005, floods in Madhya Pradesh and Gujarat in 2005, a cyclone in Andhra Pradesh, the Kosi floods in 2008, the Andhra Pradesh and Karnataka floods in 2009, the Leh cloudburst and the Uttarakhand floods in 2010 and the Sikkim earthquake in 2011 and many others all over India till 2018 Kerala floods (Singh M.M., 2019 7; Krishnan S. and Patnaik I., 2018 (4). On the other hand, India has come across numerous epidemics and pandemics since the early 19th century. A critical health component of disaster management is the containment of epidemics. The first major Cholera pandemic came out in a year (1817) had brought a very heavy rainfall led to flooding that goes along with 4 other Cholera pandemics till (1899). Bombay Plague Epidemic in (1896), then Influenza pandemic at the beginning of in 20th century, Polio (till the 1970s), smallpox in (1974) and plague epidemic at the end of 20th century. Thereafter, in the 21st century, plague (2002), dengue (2003), SARS (2003), Meningococcal Meningitis Epidemic (2005). Chikungunya and Dengue Outbreak (2006), Gujarat Jaundice epidemic and H1N1 Flu Pandemic (2009), Odisha Jaundice Epidemic (2014), Indian Swine Flu Outbreak (2015), Nipah Outbreak (2018) and the current Coronavirus pandemic (2020) (Swetha G, 2019 (8).

Covid-19 and response system in India

WHO was informed about the cases of pneumonia from Wuhan city, Hubei province in mid of December 2019 and on 7th January identified the cases of Coronavirus as a causative agent for the disease named as COVID-19. WHO has declared COVID-19 as a pandemic situation on 11th March 2020. However, the virus had already spread up to 200 other countries, and 160 of these countries reported cases as a result of local transmission. Soon after, India was among those countries which had more than 1000 cases and 50 deaths at the end of March due to local transmission. The clusters of infections were found in multiple states mainly in Kerala, Maharashtra, Rajasthan, Uttar Pradesh, Delhi, etc. (COVID-19, Ministry of Health and Family Welfare, 2019(9). Further, channels of spread due to no early travel ban and quarantine restrictions for travellers from many countries except those selected high-risk ones. India had imposed a nationwide lockdown on 22nd march to control the spread of infections. However, massive mobility of seasonal migrants and the working population shifted back to their hometowns without any screening at railway stations and airports. Besides, 6.9 million people in India see to outpatient services on daily basis from any type of health facility, however during Covid-19; it increased the chance of being infected for this section of population because of paying no attention to health care services at a routine basis. Further,

delaying of health care services and child immunization became a barrier. Transportation has become a hurdle to reach out for emergency services during the crisis. Mobility restriction of front line health workers may have led to thousands of deaths of pregnant women and children (Ganguly D., Misra S., Goli S., 2020(10)).

The surveillance system in India

India has an Integrated Disease Surveillance System that was set up by the Ministry of Health and Family Welfare in support of World Bank in the year 1997 that collects data on epidemic-prone communicable diseases every week and monitors trend of occurrences and takes certain measures to control the disease outbreaks by providing health assessment during disasters. Apart from that, it evaluates the public health interventions and resource distributions to assess the performance (NCDC, MOHFW, 2018 (11); Krishnan S., Patnaik I., 2018 (12)). India has now capable of managing to detect and respond to the various infectious diseases all over the Indian states however for Covid-19 an unknown disease, we have weak surveillance of early tracing contacts, speedy reporting and diagnosis as a consequence India needs to strengthen the surveillance system (Gopichandran V.; Subramaniam S., 2020 (13). Thus, it is necessary to strengthen its surveillance and response capacities in the country to cope with the adverse impact of climate change and disease epidemics. This shifted our focus towards our health system delivery during public health emergencies (an infectious disease outbreak or a natural disaster) and enough preparedness to conquer the challenges.

Disaster Risk Management (DRM) in India

In India, the National Disaster Risk Management was introduced & integrated Disaster Risk Reduction (reducing disaster-related risks into health during public health emergencies like epidemics of common diseases such as Swine flu, Malaria, HIV, and so on (National Institute on Disaster Management, 2012¹⁴). According to the United Nations recommendation for implementation of disaster risk reduction, the Sendai Framework for Disaster risk reduction will improve resilience to disasters 2015-30. The National Disaster Management Plan of 2016 is broadly aligned with the goals and priorities set out in Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030. It aims to make Indian disaster resilient by 2030 and achieve disaster risk reduction and loss of lives, livelihoods and health in sectors such as economic, structural, legal, social, health, cultural, educational, environmental, technological, political, and institutional by strengthening management to deal with disasters at all levels. Sendai framework is common for climate change and disasters risk reduction and sustainable development. It also includes epidemics and pandemics about International health regulations (2005). The framework highlights the

health concerns and is relevant for the health sector (National Disaster Management Authority, 2016 (15); Selma AA., Murray V., 2015 (16).

The Government of India has taken certain inclusive steps through the establishment of SDG goals 3.c “*Strengthen the capacity for early warning, risk reduction and management of national and global health risks*” covered essential points to achieve UHC by 2030. It signifies access to healthcare services without any financial hardship through trained health workforce. Strengthening the capacity of public health risk management and reduction are all ensured by UHC (NITI Aayog, 2018(17). “Universal Health Coverage”(UHC) is defined as a scenario where everyone is covered for basic healthcare services. This ensures Indian citizens to have easy and affordable access to promotive, preventive, curative and rehabilitative health services regardless of their economic, social and cultural backgrounds. People are protected from financial hardships by receiving affordable and accountable quality healthcare (Universal Health Coverage Booklet, UN & India (18).

Building resilience against natural hazards and epidemics

Strengthening of SFDRR can be effective following a roadmap for implementing resilience-building measures. Resilience is an approach to DRM that brings out shared responsibility of government and communities. It is something addition to disaster risk management (Bahadur A., Lovell E. and Pichon F., 2016(19). A study defined a resilient health system as “A resilient health system is one in which the institutions, personnel, policymakers and all the important health system actors prepare for and effectively respond to crises, at the same time maintaining core system functions”. A resilient health system needs effective governance with funding during a crisis (Gopichandran V.; Subramaniam S., 2020 (5).

The state of Assam is using a resilience approach through five mission areas which include disaster mitigation through structural and non-structural measures. The mitigation plan identification of disasters, risk assessment, establish a framework for mitigation, aims towards vulnerabilities and provide a strategy at all levels of the state to reduce future loss of lives through implementing mitigation projects. Natural disasters include climatic and biological such as flood, cyclone, drought, severe weather conditions, epidemic/pandemic, etc. Natural and man-made hazards are significantly increasing in India due to rapidly expanding population, the extension of urbanizing areas, creation of new assets/infrastructure, rising interdependency among sectors for the flow of goods and services, and rising economic development (Assam State Disaster Management Authority(20).

Strengthening Health System Resilience

A health system should be resilient is one that can anticipate, respond with greater capacity, to prepare for and cope with changing risks, to bring sustained improvements in population health. The WHO's document on "Operational Framework for building Climate-resilient health systems" identified building blocks of health system essential to support the delivery of Universal Health Coverage and improved outcomes. The six components of the health system are Leadership & governance, Health workforce, Health information systems, Essential medical products & technologies, Service delivery and & Health financing. Integrating these blocks in creating a unified system is the need of the hour (WHO, 2015(21).

Based on priorities the health system resilience should be enhanced by integrating disaster risk management to the building blocks of Health System. The four priorities for action of the Sendai Framework focus on:

1. Understanding disaster risk and its management
2. Strengthening governance at all levels to manage the risk
3. Investment in risk reduction for resilience and
4. Disaster preparedness for effective response and recovery

Table 1. Existing Framework for Health system resilience and public health DRM through African Viewpoint

Building blocks of Health system	Public health interventions for effective DRM (Priorities)
Leadership & Governance	<p>The governance framework for public health disaster response plans, the establishment of emergency public health coordination committees and keep an eye on supervision, monitoring, and evaluation of emergency health response</p> <p>There should be a framework for public health disaster preparedness, planning of the likelihood of health emergency, development of business stability plans and to establish a mechanism for public health emergency management.</p> <p>Development of an institutional framework for public health DRR, national health policies and strategies must include DRR, Establishment of public health DRR management committees.</p> <p>Establishment of coordination structures for implementing health system recovery programs, strengthening regulatory functions of government, review or update strategies/ guidelines of various health programs.</p>
Health Workforce	<p>The response through re-distribution of the existing health workforce, reproducing additional health human resource and protection of them against infection prevention and control of emergency public health experts for better</p>

	<p>access.</p> <p>Training of rapid health response teams and preparing a roster of emergency public health experts.</p> <p>Conduct a training needs assessment of human resource in health and providing training of health workers on health DRR and infection prevention and control.</p> <p>Governance through assessing the impact of a disaster on human resources in health, Guidelines for scaling up capacity for increased health demands, capacity development for the required community health workers in the delivery of health services, their strengthening health training and making training and retention packages and establishment of job rotation system among the staff.</p>
Health Information system	<p>For effective response strategy prompt health assessments need to be done, Establishment of public health disease surveillance system for hazardous events, community surveillance, mapping of availability of Health services, conduction of specialized surveys such as mortality survey</p> <p>Preparedness through an establishment of public health early warning systems and public health surveillance system for disease and nutrition</p> <p>To reduce the risk of Public health disaster assessments and Implementation of Health Facility Safety Index (HIS) surveys needs to be done</p> <p>Strengthen governance through routine disease surveillance and health information management system and Health DRM capacity assessments</p>
Essential medical products and technologies	<p>For an effective response, there should be the procurement of emergency health kits, personal protective equipment, and other medical supplies during a crisis, strengthening of medical supply chain system.</p> <p>Preparedness through an in the advance list of essential medicines, emergency health kits, etc. Procurement and deployment of emergency health kits, establishment of quality assurance system for essential medicines, kits and the supply chain systems for medicines, vaccines, and medical equipment</p> <p>Risk reduction through assessment of risks to stockpile of medical products, equipment, and vaccines and appropriate siting and storage of medical products, vaccines, and medical equipment</p> <p>Strengthen governance supply chain management system, Institution of quality assurance mechanisms for medical products, vaccines, and equipment, Development of essential medicines list and guidelines for rational use of medicines and training of health workers and Standardization of medical equipment according to levels of care and strengthening maintenance functions and skills</p>

Financing	<p>Allocation of funds for public health disaster response, a framework for universal health coverage and health insurance</p> <p>Allocation of funds to public health disaster preparedness and establishment of public health emergency funds</p> <p>Development of a framework for universal health coverage during disasters and Allocation of funds to health DRR</p> <p>Strengthening governance through Resource mobilization and allocation of funds for health system recovery, funding for community and social insurance and need to strengthen government financial management systems.</p>
Service delivery	<p>The disaster response must include Fatality management including medical evacuation, Building of temporary public health facilities, Public health risk communication, Delivery of primary health-care services, Preventive services such as immunization, bed nets, etc., specialized health services such as mental health, HIV/TB, NCD treatment, and Infection prevention and control.</p> <p>Public health interventions involve preparedness needs public health risk communication and preparing camps for treatment and isolation centres.</p> <p>The disaster risk can be reduced by the delivery through additional at-risk health facilities, public health awareness campaigns and mitigation into action.</p> <p>Strengthen governance by revising basic healthcare package to address the crisis, address equity issues considering the use of services based on socioeconomic factors; improve services coverage through the implementation of community-based initiatives.</p>

Source: (Olu O.,2017 (22)

According to the African viewpoint, the table above shows the integration of a health system framework to public health DRM based on Sendai framework. This shows the building blocks of health system association with DRM elements and public health interventions which is directing us towards the goal 3 c. and covered essential points to achieve UHC by 2030.

India Covid-19 risk reduction and management strategy well-thought-out the financial hardship, training Human Resource in Health, and capacity of PHDRM. Assessing the risk of disasters can be paired with and enhance response to epidemics or pandemics to such as COVID-19. The Ministry of Family Health and Welfare covered essential points of UHC, access to healthcare services without any financial hardship through trained health workforce and strengthening the capacity of public health risk management and reduction.

Table 2. Public health interventions during Covid-19 in India

Containment plan for large outbreaks, Covid-19, an action plan for responding to the possible scenarios based on strategic approach/ coordination committees established
India COVID-19 Emergency Response and Health Systems Preparedness Project aimed to deliver an emergency response and health system capacity building (23).
A health advisory for human resource management of Covid-19 has been prepared. Training of health workers on infection prevention and control and clinical management has been conducted through Webinars and Diksha platform; also mandate some training guidelines also
Under PM Gareeb Kalyan Package was announced as an accidental insurance cover 50 lakhs for 22 lakh health workers for providing services to COVID patients. The scheme cover loss of life or accident-related work or job.
The MOHFW has nearly 5 lakh PPEs and additional 30 lakh N95 masks after 16 lakh masks supplied across hospitals by Central Government. To strengthen the medical supplies 50 domestic manufacturers were given orders for 1 crore PPEs tested
An SOP for allocation of additional health workforce for hospital management has been issued.
Identified the rapid health response team of personal and volunteers across sectors and mapped the roles of cadres (24).
MOHFW made a guideline for Facility mapping and planning of all existing health facilities for service delivery. Recommendation for Disease surveillance, service delivery monitoring and reporting using health system approach for essential service delivery
India Ministry of Family Health and Welfare made guidelines for Enabling Delivery of Essential Health Services during the COVID 19 Outbreak using health system approach (25).

Hospitals play critical roles in disaster events by providing essential medical care. However, most of the hospitals in India are not equipped with biological disasters. Further, lack of proper planning and preparedness to meet the health needs of people. The lack of internal and external communication, management, and technological challenges are the common problems faced in the Health sector⁽²⁶⁾.

Currently, besides various public health guidelines, plans and policies to reduce the spread of Covid-19, the recent Covid-19 outbreak has also placed unexpected demand for medical care on our Indian health system. As a result, the country needs a resilient health system with an existing capacity to fight against crisis through management, preparedness, emergency medical response and recovery.

Conclusions

The article provides a step in refining the approach and application of health system resilience so that the health system takes action to be able to respond and recover from disease outbreaks and other natural hazards. India bearing the infectious disease pandemic has so far put efforts to handle the crisis; however the late response, unprepared health structure and negligence appeared as a weak resilience health system.

The African Viewpoint can help our country to assess and improve their core public health capacities and could help to develop an improve resilience to public health crises. Based on the framework, there remains a need better surveillance in public health service through effective governance, HRH, financial support, service delivery, health information system and medical supply chain management as well as improve their preparedness and response for emergencies.

Author Statements

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Competing interest

None

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