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Assessment of coping capacity of public health facilities with health emergency situations during an event of flood in Mumbai

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Abstract:

BACKGROUND: Floods had been a repeated phenomenon in India, causing considerable losses to properties, life and infrastructure, and public utilities. Floods are found to be a common natural disaster occurring not only in developing countries but also in developed nations. Hospital preparedness against disaster could help in the management of the surge of patients in an effective manner. This study aims to assess the capacity of public health facilities for coping up with health emergency situations during an event of flood in Mumbai.

MATERIALS AND METHODS: A cross-sectional study was conducted among 38 public health facilities in Mumbai. A purposive sampling technique was used for the selection of the health facilities. Administrative staff, medical officers, and pharmacy in charges were included in the study.

RESULTS: The study revealed that surge capacities in hospitals were adequate as they had additional beds for monsoon-related diseases for the preceding flood situation. There was a triage policy, and the staff were trained on the same. Procurement of drugs was easy because of a good networking system between hospitals. Due to this networking system, patients were also transferred to the nearest healthcare facility in a short span of time.

CONCLUSION: The response during an event of a flood in the health facilities of Mumbai city was good as they have regular training sessions to be prepared for the emergency situations during monsoon as they have repeated exposure to floods.

Keywords:

Coping strategies, Mumbai floods, preparedness and response, risk communication, surge capacity

Introduction

The global climate is gradually modifying the weather patterns all over the world which in turn is paving way for climate related disasters. The data on weather-related incidents between 1996 and 2015 indicated a rise in worldwide weather- and climate-related disasters. More than twice as many climate-related disasters have been reported since 2000, at 341, a number that is 44% higher than the average between 1994 and 2000.^[1] A common

natural disaster occurring in developing and developed countries alike is the floods. 3,119 floods that occurred worldwide in the previous 30 years had an impact on more than 2.8 billion people, killing more than 200,000 people and injuring many more.^[2] The mortality caused by natural catastrophes indicates a temporal rise and geographic linkage worldwide.^[3] After China, the country which is most affected by floods is India.^[4] India is highly vulnerable to floods. Almost 40 million hectares (mha) is prone to floods out of the total geographic area of 329 mha.^[5] It had been a repeated

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phenomenon in India causing huge losses to properties, life and infrastructure and public utilities. Between the period from 1980 to 2011, floods were the reason for a major economic impact among all the other disasters in India. Floods alone accounted for 68% of total disaster-related damages.^[6,7] The states of Gujarat and Maharashtra in Western India experienced severe flooding in 2005 that resulted in both human casualties and economic loss, the impact being more in Mumbai.^[3]

The floods had impacted the health of the Mumbai population in several ways. The 2005 floods in Mumbai affected 4.2 million people causing a damage of Rs. 35 billion.^[8] Disasters damage hospitals, water and sanitation systems across large areas which creates an environment for the spread of the diseases.^[9] Within one month period, in all 310 cases of leptospirosis and 27 deaths were reported in six wards of Mumbai during this event. The records of leptospirosis reported cases was compared with the years when no flood occurred, and it was found that there was an increase in the incidence of leptospirosis in the flood year.^[10] During this event, approximately 100 deaths were due to drowning and house collapse.^[10] The subsequent occurrence of 2005 flood event in Mumbai followed every consecutive year. The impact of the flood on health varies between the populations based on type, vulnerabilities, and severity of flooding. The flood can cause physical injuries to individuals attempting to rescue people. Faeco-oral transmission of disease could potentially increase during flooding, especially in areas where there is poor access to clean water and sanitation. There is a complex relationship between floods and vector-borne diseases. Breeding mosquitoes in stagnant and slow-moving water, such as ponds and puddles, could transmit many diseases like leptospirosis and dengue. These public health problems during floods re-emphasise the significance of emergency preparedness and response of the hospitals and the health systems. Particularly in nations that are prone to disaster, the hospital and the health system should be completely ready for emergencies in order to minimise the number of fatalities and injuries.^[11] Hence understanding the significance of disaster preparedness, India held the G20 Presidency during the first meeting of the Disaster Risk Reduction Work Group (DRR WG), when it emphasised the significance of Disaster Risk Reduction.^[12]

The hospital preparedness constitutes of planning, training and mock drills which help in managing the surge of patients. The ability to provide efficient emergency care is indicated by surge capacity.^[13] Poor disaster preparedness at the hospital level could lead to poor patient outcomes. Hospital surge capacity plan is important to tackle events during flood. Planning and preparedness activities will minimize the needless loss of life and maximize the

response to the disaster. Therefore, it is significant to have a preparedness plan which is the first step to enhance the coping capacity of the public health facilities toward an event of public health importance. It is important to assess the hospital's readiness to find any weaknesses in the plan and ensure it can function effectively in an emergency.^[13] Hence this study was designed to assess the capacity of public health facilities for coping up with health emergency situations during an event of flood.

Materials and Methods

Study design and settings

This was a cross-sectional study conducted in the Mumbai district between January 2020 and May 2020. Mumbai is divided into two distinct regions: Mumbai district and Mumbai Suburban district. The public health system in the Mumbai district differs from other parts of India as it is run by the Municipal Corporation of greater Mumbai (MCGM). MCGM has a network of four medical colleges, one dental college, 16 peripheral hospitals, six specialty care hospitals, 175 dispensaries, and 183 health posts owned and operated by them. Tertiary and specialty hospitals provide primary- to tertiary-level care. Health posts for antenatal care (ANC) and immunization and MCGM dispensaries for curative care for common ailments were the main sentinel sites for outreach public health services.

Study participants and sampling

A total of 38 public health facilities were purposively selected from across the various health facilities of the MCGM, out of which 10 were secondary care, 3 tertiary care, 25 primary care, and 1 infectious disease specialty care. The study included participants such as administrative staffs, medical officers, epidemiologists, and the pharmacy in charge because they were the personnel who manage the emergency crisis. From each hospital, five participants were planned to be included, and one medical officer from each dispensary; hence, the estimated sample size was 83, which was achieved.

Ethical consideration

After obtaining approval from the Institutional Ethical Committee of Kasturba Medical College and Kasturba Hospital (KMC and KH), Manipal (IEC Reference Number – 906/2019), the study was conducted. The participants were given the participant information sheet, and the informed consent was obtained before the data collection.

Data collection tool and technique

The questionnaire was designed based on the core capacities of the International Health Regulations (IHR) monitoring and evaluation framework. The questions were allocated in the following major domains of

response and preparedness [Table 1]. It was used to collect the data from the administrative staff of healthcare. The time taken for each interview was 30 minutes. The data collected were analysed with the help of Microsoft Excel and were expressed in percentages and frequencies.

Results

The study included participants from the management department [26 (31.32%)], medical officers [44 (52.01%)], and the pharmacy department [13 (15.66%)]. The majority of them [67.47% (56 out of 83)] were found to have a minimum of 10 years of experience.

Emergency preparedness and response planning

Among 45 respondents, all mentioned that the health facility had an emergency response plan and incident command group in place in their facility and said that there was an on-call doctor list and medical first aid responder in their health facility. All the professional healthcare staff received at least one training session on a topic related to the outbreak, monsoon-related diseases, and disaster management. The majority of respondents [77.78% (35 out of 45)] stated that training was conducted in their organization annually before monsoon seasons. The majority (57.78%) mentioned that there were no mock drills performed in their facility, and the rest (42.22%) said it was conducted for fire safety [Figure 1]. All the hospitals were following the triage protocol and had a back-up plan for water/power supply during emergency situations. Among the 69 participants interviewed, 95.71% were aware that the patients had to be referred to the infectious disease specialty hospital [Figure 2].

Surge capacity

The majority (37.78%) of respondents mentioned that their bed capacity was between 100 and 299 beds in their hospitals, and 6.67% said that it was less than 100 beds [Figure 3]. Among the 45 participants, 55.56% mentioned that they had isolation ward facilities in their hospitals, and out of participants who mentioned that there was an isolation ward in their facility, 88% (22 out of 25) respondents mentioned that the distance between beds in isolation wards of their hospitals was 2 meters [Table 1]. After interviewing participants from 13 various hospitals, 84.44% (38 out of 45) respondents answered that they refer patients to the nearest peripheral or tertiary care whenever there was an upsurge in the number of patients.

Table 1: Distance between the beds in isolation wards

Distance between beds in isolation wards	Frequency (%) n=25
3 meters	3 (12%)
2 meters	22 (88%)
Total	25 (100%)

Medical countermeasures

Every 13 respondents from the pharmacy department replied that they prioritize and monitor the drugs during the upsurge. They also mentioned that all hospital staff were provided with personal protective equipment (PPE) during an outbreak.

Risk communication

All 45 respondents answered that the landline was the mode of communication used to exchange information

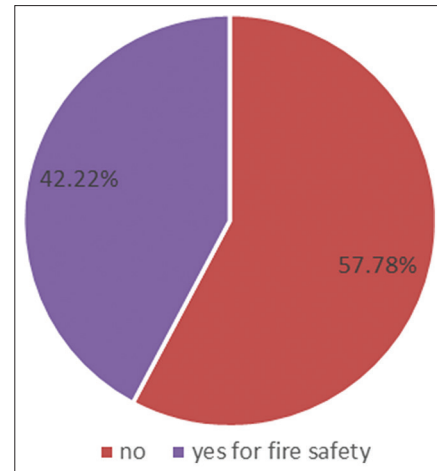


Figure 1: Presence of mock drill system in hospitals (n = 45)

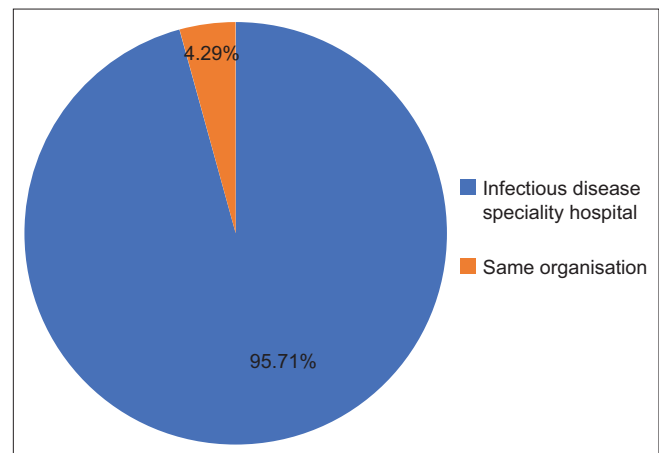


Figure 2: Referral system for infectious disease patients in hospitals: (n = 70)

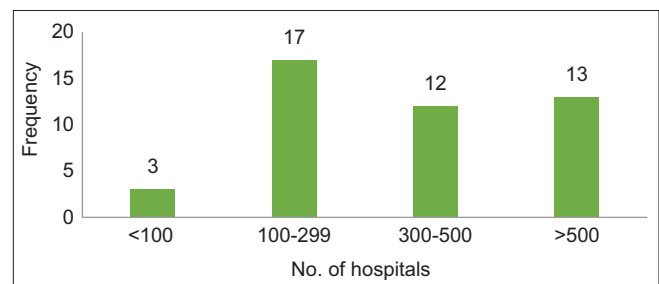


Figure 3: Distribution of hospitals according to the bed capacity (n = 45)

with other staff in hospitals during emergency situations, and in the event of landline failure, 88% said they used personal phones, and 6.67% used walkie-talkies as a backup. There were designated personnel like casualty medical officers and on-duty medical officers for exchanging information with other staff, as mentioned by all 45 participants. A maximum of 69% ($n = 45$) of respondents mentioned that they convey the message of health emergency through information, education, and communication (IEC) materials and health post workers.

Stockpiling policy

As for the stockpiling policy, all respondents ($n = 13$) said they had essential medicines/vaccines for treating flood-related health issues. They also said they had a system in place for emergency procurement of drugs/vaccines if needed. The majority of the respondents, 76.92% ($n = 13$), stated that drugs take 2 hours and vaccines take 3 days to reach the hospitals during a health emergency [Figure 4].

Rapid response team

During the last three years, the majority of the respondents, 73% ($n = 45$), answered that their staffs had taken part in health emergency situations in the past 3 years [Figure 5], which included the doctors, Chief Medical Officer (CMO) on duty, nurses, ward boys,

epidemiology department, microbiologist, and public health department to play a role during emergency situations.

Coordinated response

The maximum, 93.33% ($n = 45$), informed that they were making use of other available wards in the same facility during upsurge situations, and only 6.67% said that they increase the bed capacity [Figure 6]. In health facilities where blood bank services were absent, 62.50% (10 out of 16) replied that they make it available from the nearest peripheral hospital [Figure 7]. In context about the reporting system for any notifiable diseases, more than 50% respondents informed that they send weekly reports to epidemiology cells and the data compiled were then shared with the state [Figure 8].

Emergency response operations

There was an additional care unit kept for monsoon upsurge in their health facility according to 91.11% ($n = 45$) of the respondents, and all hospitals had kept a contact list of health facilities for the general public during an emergency and had the list of nearest specialty care hospitals.

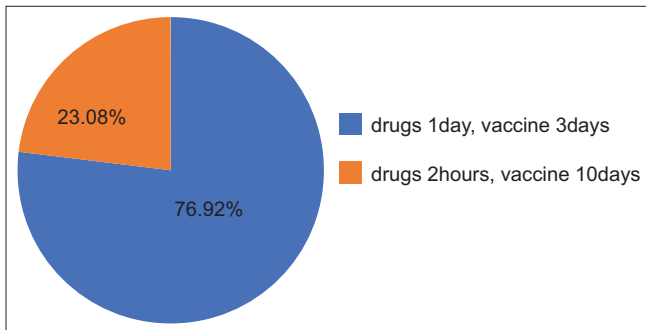


Figure 4: Procurement time for drugs/vaccines during emergency situations ($n = 13$)

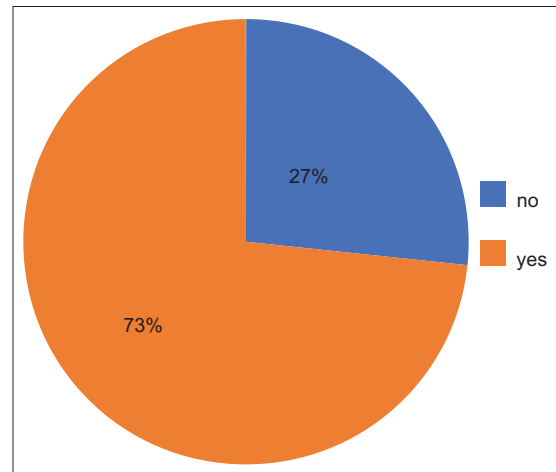


Figure 5: Participation of staffs in health emergency for response action ($n = 45$)

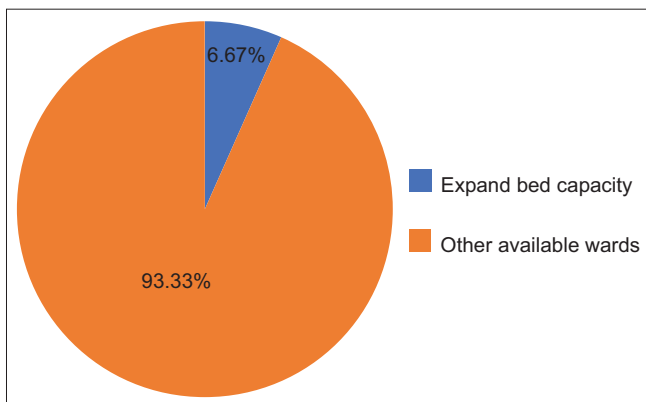


Figure 6: Management of bed shortage in hospitals for surge response ($n = 45$)

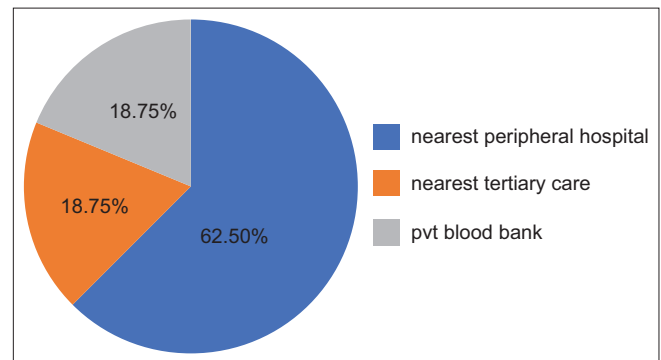


Figure 7: Distribution of health facilities according to the management of blood bank facilities during health emergency situations ($n = 16$)

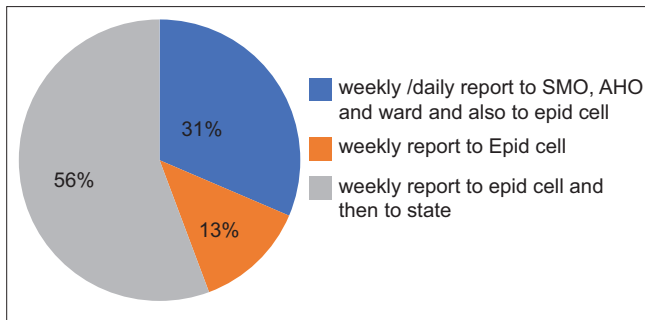


Figure 8: Mode of reporting system for infectious diseases in various hospitals (n = 70)

Discussion

In a country which is at risk of recurrence of disasters, disaster risk reduction plays a significant role for the social and economic development of the country which is essential for the sustainable development of the future.^[14] National guidelines that are developed in the country are important as it serves as an important tool for health professionals, policymakers, and researchers. National guidelines for infection prevention and control (IPC) in health care facilities (HCF) mentioned that all staff members, irrespective of their individual routine duties, need training in implementing procedures and protocols described in the Hospital Emergency Response Plan^[15] in the current study, every hospital had medical first aid responders and all the professional health care staff received at least one training session on a topic related to the outbreak, monsoon related diseases, and disaster management. The majority of the respondents stated that training was conducted in their organization annually before the monsoon season. According to the National Accreditation Board for Hospitals and health care providers (NABH),^[16] mock drills should be conducted for fire and important non-fire emergencies. In most of the health facilities either there were no mock drills, or it was conducted only for fire safety. National guidelines for infection prevention and control in health care facilities^[14] suggested that the desired space between beds in the isolation wards should be 1–2 meters. In the current study, the health facilities had bed spacing of 2 meters in their facility, whereas some of the health facilities had kept 3 meters distance. The World health organization (WHO) guidelines stated that hospitals identify the areas that could serve as temporary morgues.^[17] However, the health facilities had the facility to make temporary morgue in case of upsurge, and the rest did not have that system in place. National guidelines for IPC in HCF^[14] also mentioned that communications activities undertaken in response to an emergency should be coordinated through the senior hospital staff. All the health facilities had designated personnel, like casualty medical officers, who were

involved in the exchange of information to other staff, hence the hospital policy was in concordance with the given guidelines. Weekly report to the epidemiology cell and compiled data is then shared with the state.

NABH guidelines also suggested that if the organization does not have the blood bank facility available, it is preferable that the organization define the time frame within which blood must be available for use in an emergency.^[18] In the current study, the health facilities had provision of blood bank services from the nearest peripheral hospital, nearest tertiary care, and had a private blood bank tie-up. The National disaster management guidelines for hospital safety (NDMA) suggested that there should be a list of all networked hospitals (along with their capacity and specialty).^[19,20] All 13 hospitals had a list of nearest hospitals, including specialty care as per the suggested guidelines.

Health care workers were habituated in managing patients based on standard traditional care. However, they should have the ability to recognize signs of health emergencies and their consequences. The disaster preparedness score per the disaster resilience index in Maharashtra is 27.5 out of 50, the highest among all the states.^[18] Surge capacities in hospitals were adequate as they had additional beds for monsoon-related diseases for the receding flood. Stockpiling policy was adequate as they had essential medicines/vaccines in place to tackle flood-related issues and had emergency procurement system for the same. Drug procurement was easy because of a good network between hospitals and local purchases. Furthermore, due to this networking system, patients were easily transferred to the nearest care for critical care in a short time. However, the study had potential limitations, firstly, laboratory capacity plays a crucial role in health emergencies; hence it would be helpful if laboratory capacity was also included in future studies.

Conclusion

Reduction of the health risks and the repercussions due to public health emergencies is significant to local, national, and global health security. Emergency response in the health facilities in Mumbai were good as the city had been exposed to recurrent floods due to monsoon since 2005. Hence capacity-building sessions were carried out every year before monsoon season so that the healthcare system was prepared to face the emergency situations. The public health facilities in the city too had good networking system in terms of reference of the affected people, blood management, and medical supplies. The surge capacity and stockpiling policy was also adequate. Effective management of public health emergencies is important for the success of the Sustainable Development Goals (SDGs) and implementation of Universal Health Coverage (UHC).

Subsequently, the increasing risk of natural disasters calls for high level dialogue on prioritising the financing for disaster risk reduction as systematic preparedness in advance of crisis has demonstrated significant return on investment.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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