ORIGINAL ARTICLE

Urban Flood Relief Management in COVID-19 Pandemic

Abhishek Tiwari[1], Khurshid Parveen[2], Shivendra Kumar Singh[3], Manish Manar[4]

[1]Assistant Professor, Department of Community Medicine, Motilal Nehru Medical College, Prayagraj, Uttar Pradesh; [2]Professor and Head, Department of Community Medicine, Motilal Nehru Medical College, Prayagraj, Uttar Pradesh; [3]Professor, Department of Community Medicine & Public Health, King George's Medical University, Lucknow, Uttar Pradesh; [4]Additional Professor, Department of Community Medicine & Public Health, King George's Medical University, Lucknow, Uttar Pradesh

Corresponding Author

Dr Manish Manar, Department of Community Medicine & Public Health, King George's Medical University, Lucknow
E Mail ID: manar.781@gmail.com

Citation

Tiwari A, Parveen K, Singh SK, Manar M. Urban Flood Relief Management in COVID-19 Pandemic. Manish ManarIndian J Comm Health. 2022;34(2):301-305. https://doi.org/10.47203/IJCH.2022.v34i02.028

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

Article Cycle

Received: 25/05/2022; **Revision:** 15/06/2022; **Accepted:** 22/06/2022; **Published:** 30/06/2022

Abstract

Introduction: Urban floods were addressed as a separate disaster after the historical 2005 Mumbai floods. Urban flood peaks are 2-8 times and volume 6 times when compared with rural floods. We are now handling multiple disasters simultaneously due to the Covid-19 Pandemic. The river plains of north India are prone to floods in the monsoon season and geographical location of Prayagraj doubles the damage because it faces wrath from two sides. Very few researches have been conducted on urban floods and evidence needs to be generated from the field. **Methodology**: This qualitative research was planned with an objective to identify the difficulties faced in operating an urban flood relief camp during superimposed burden of COVID-19 Pandemic and to suggest remedial measures from the public health aspect. We conducted in-depth interviews of nodal officers, health staff and beneficiaries of the identified camps. Informed consent was taken from participant after explaining them about the research. **Results**: The findings from the interviews were categorized into 3phases of flood relief i.e. before the floods, during floods and lastly post flood. The most crucial work before floods is to spread awareness about do's and don'ts in detail. Next was identification of the local people actually affected by flood. The space and facilities at few centers was low for the population load. Urban flood management needs a major overhauling of public health infrastructure to handle such disasters in future. **Conclusion**: The officials were working hard to make the homeless feel as if they are on a picnic. The database of beneficiaries should be strengthened and should also include students and labourers, anyone who is a flood victim and not only local flood victims.

Keywords

Urban Floods; COVID-19; Prayagraj; Flood Relief Camps; Disaster Management

Introduction

India is highly vulnerable to floods, every year loss of infrastructure, public utilities, property and even lives due to floods. The damages shows an increasing trend in the last 10 years due to various reasons including rapid urbanization. In-fact urban floods were addressed as a separate disaster by our National Disaster Response Force (NDRF) after historical 2005 Mumbai floods.(1,2). The COVID-19 pandemic has forced us to handle more than one disaster simultaneously (3,4). The National expert group working on disasters stressed on urgent need for creating evidence-based knowledge in multiple disaster settings.

City of Prayagraj, Uttar Pradesh is well known for organizing the Kumbh Mela, largest religious congregation at Sangam. City is bordered on two sides by rivers Ganga and Yamuna and third side by their confluence. The floodplains of the two major rivers occupy large areas and thus make it prone for urban floods. This geography has also restricted choices of urban expansion; forcing people to settle is these low-lying flood prone areas as it's close to city center and cheaper land rates. Almost every year during monsoons people face the wrath and havoc of

urban floods, but very few researches and literature are available on urban floods. This research study has been planned to understand the urban flood relief management from public health lens to mitigate the losses (5-10).

Aims & Objectives

1. To identify the difficulties faced in operating an urban flood relief camp during superimposed burden of COVID-19 Pandemic.
2. To find out the lessons learnt in this activity and to suggest remedial measures for the difficulties from the public health aspect.

Material & Methods

This qualitative research was conducted through In-depth Interviews (IDIs) with nodal person and the beneficiaries. The District Disaster Cell was approached for permission and support. The list of all relief centers of urban area along with contact details of nodal officers and medical teams was obtained. As there was wide variation in number of families in different camps, three most populous camps were selected having 193, 143 and 125 registered families. The nodal officers and medical team members who had worked in these identified camps were contacted to conduct In-depth interviews as per their feasibility. Informed written consent was taken from each participant after explaining them in detail about their role and purpose of this study. Research teams also visited the site of the camps to conduct IDI with beneficiaries, who had stayed in the identified camps.

Ethical Issues: Ethical approval granted by IEC of MLN Medical College, Prayagraj.

Study population: The nodal officers of relief camps, medical team members and the people who stayed in the identified camps.

Study Area: Flood relief camps established in urban areas of Prayagraj.

Sample Size: A total of 29 IDI could be completed which had 8 nodal officers, 6 health team members and 15 beneficiaries to ensure equal representativeness.

Sampling Technique: Purposive sapling technique was used to include participants based on operational feasibility and time constraints.

Data Collection Tools: The IDI was conducted using a schedule and audio recorded. IDI has questions about the process and difficulties, their experience and feedback. The transcripts were generated and later transliterated for making complete notes.

Inclusion Criterion: The nodal officers who have worked as in charge of urban relief camps identified for entire duration, or the workers of the health team and people who stayed in identified camps.

Data Analysis: Data analysis was done using Narrative analysis and disclosure analysis - a qualitative analytic strategy (11).

Results

Prayagraj has a humid subtropical climate with monsoons from early July till September (12). As the rainy season sets it, residents of low lying areas start their preparation to mitigate flood at their level. As per the official report of 2021 Urban Floods, Prayagraj had 38 areas submerged affecting around 3.20 lakhs citizens. It forced 3,500 people to move to relief camps as their own homes were inaccessible. During floods boats were only means for transport and rescue operations.(13). We identified 3 camps for study catering maximum number of families, namely Cantonment High School, Sadar (193 families), Annie Besant School (143 families) and Krishna Guest House (125 families).

The findings from interviews have been categorized in 3 phases of operation as given in Table 1

Phase-I: 5th August onwards: *Water at alert level of 83.73 meter.*

- Administration kept a vigil on rising level of both rivers and communicated it to people, for moving to high level areas or Relief Camp.
- Many low lying areas were already submerged even before the rivers touched their danger mark.
- Schools and colleges were closed as many of them are identified relief camps in plan
- Evacuation started by NDRF using motorized and local boatmen *(mallah)* with boats.
- Jal-Police did night patrolling as many people had left their belongings in upper floors of houses.
- Electricity was disconnected in submerged areas to prevent accidents.

Phase II - 9th-15th August 2021. *Danger mark (84.74m) crossed on 9th August.*

- Total 12 camps were functional with 1147 registered families by 11th Aug. Covid help desk was set up and had antigen testing facility for the symptomatic. People were referred for RT-Pcr and vaccination to hospitals.
- All beneficiaries were registered in camps using their govt. ID of local address.
- Bedding arranged from tent houses on rent. Generator for back up of electricity.
- Additional mobile toilet units were kept for people not staying in camp, because many people were staying on upper floors but the toilets were all flooded.
- Breakfast, lunch and dinner was distributed free of cost to all those registered at the camp.
- *Parag* diary provided milk to all camps at discounted rate.
- Washrooms were marked for Females and temporary changing rooms created where bathrooms were not available in large numbers.
- NGO's and other volunteers distributed biscuits, cakes etc. to children

- Medical teams were stationed in all camps and an emergency mobile unit was on standby.
- Extensive use of social media was done to monitor the activities occurring at camps
- Visit by public representatives, administrative officers and local leaders was a big motivation for staff
- All private coaching were closed later to avoid rush and confusion during food distribution at the camps as large number of students preparing for competitive exams stay in these areas.

Phase III – Beyond 15th August. *Water started receding fast below danger mark*

- Advisory announcements given to people to clean their houses and spray disinfectant to avoid spread of infectious diseases before shifting there.
- Each family was handed a Flood Relief Kit, containing 5 liters cooking oil, 10kg rice, 10 kg atta, chana dal, masala, puffed rice, salt, turmeric, potato & vegetables etc. about 14 items. So that the family does not face hardships in getting essential supply for cooking food for initial few days.
- It also had 5 kg bleaching powder and a packet of 10 different medicines for common disorders.
- The cleaning and disinfection teams did a mammoth task to prevent epidemic.

Few quotes from IDI of District Nodal & Nodal officer of Camp:

"Sabse jyada mushkil camp shuru hone me aati hai, ek baar start hone ke baad chezee khud vyavasthit hone lagti hain"-

"Jo log camp me rehne aate hain unhe hume pehchan karna hota hain ki wo yahi ke ho aur prabhavit bhi ho"

"Humne camps me dono time sabse achha khana jo uplabdh ho saka wo khilaya, hum log khud bhi Covid ke karan wahi khate thee"

"Sabse bada challenge in camps me logo ki sankhya thee, mere camp me 700 log thee, ab aap samajhiye ki itne logo ka Covid ke niyamo ke saath ek sath renha, khana-peena, sona, to aabaadi hi challenge hain"

Few quotes from IDI of people who stayed in camp:

"Sarkar ne bahut achha intezam kiya thaa, hum log to beghar ho gaye thee, humara sab kuch pani me doob gaya thaa, Covid ke karan hum kisi rishtedaar ke yahaan bhi nahi ja sakte thee"

"Humlogo ko ghar se bahar nikalne ke liye sirf ek naav lagi thi, wohi bar bar chakkar laga rahi thi, hum log mask lagakar 3-4 ghante intezar karne ke baad yaha aaye, aur pani lagataar badh raha thaa"

"Toilet ganda rehta thaa! Aur Covid ke darr se log chote bachho ko idhar udhar baitha dete thee- jiske karan sabko bahut dikkat hoti thee."

Quotes from IDI of Medical teams:

"Hum logo ko Cmo office se phone aya tha ki kal se aapki flood duty hai. Wahan se ek bag bharke saman de diyagaya, baatne (distribute)ke liye. Kya saman hain, kitna hain ye sub kuch nahi bataya. To humlog apne hisaab se manage kiye.

Discussion

The extent of damage caused by urban floods depends on the dominant factor causing it. Heavy rainfall in a short period of time, indiscriminate encroachment of waterways, inadequate capacity of drains and lack of maintenance of the drainage infrastructure will all have differential consequences. We need multi-pronged approach to deal with them timely to mitigate loss.

The space available in relief camps is the most important determinant for its effective functioning. The constructed area and open area both should be available before designating it as disaster relief shelter in District Action Plan. As seen in our study one of the centers was a marriage hall where rooms, open space and toilets were much below required.

It had one large tent with beddings for everyone to sleep and rest, thus compromising the cleanliness and safety in times of Pandemic. Only 4 rooms and 3 toilets were permanently constructed. Mobile toilets were being used raising the issues of cleanliness and availability of water and light in it. Limited space for parking of vehicles of officials and NGOs visiting the camp as the Mobile toilets were parked on the road side, making it inconvenient for everyone. Few more difficulties have been identified and remedial measures suggested in Table 2.

The plight of students who stay in these areas, preparing for competitive exams was ignored. They were not entertained in these camps as they didn't have local ID and were told to go back to their homes as all coaching were closed. Most of the landlords here stay on first floor and rent out ground floors. Students had to keep their belongings to safer places and leave for their native places. The future of our country should have been taken care off in some way by administration.

All these low-lying areas are center of massive unplanned, illegal and unapproved urbanization. It's not a work of fortnight. Ignorance from multiple responsible stakeholders over the years has resulted into this situation where construction has almost reached the actual river bed. Now it has to sorted with a dual approach of preventing further constructions and modifying or removing those already constructed to clear the natural waterways. Construction of dam-based ring road is another opinion suggested by a nodal officer. These solutions need to be considered for a permanent solution.

The medical teams were not given any training or guidelines for urban flood management. They have not maintained proper record, or report as everything was on phone. The logistics provided had only OPD medicines, no injectable medicines provided, no emergency drug or kit, no medicine for hypertension or chronic disorders. Worst of all was the relief kit containing antibiotic along with pain killers and anti-diarrheal medicine. When the global

agencies are crying to prevent microbial resistance such pictures are sad to see. These findings were shared with district health authorities for needful action.

The Global climate change has changed weather patterns with increased episodes of high intensity rainfall occurring in shorter periods of time.(14) The increased urban rainfall is also attributed to urban heat island effect.(15). The average annual rainfall for Prayagraj is around 980 mm and this far exceeds 611 mm, the rainfall in London. Our infrastructure is far behind the developed nations to combat amount of rainfall. Our drainage systems were designed for rainfall intensity of 12 – 20 mm day which is insufficient today. Further, our systems often do not work to the designed capacities because of very poor maintenance. Rapid urban expansion has blocked the natural land drainage channels, improper disposal of solid waste, including domestic, commercial and industrial waste and dumping of construction debris into the drains also contribute to the disaster. Post-flood period of infection, loss of livelihood and in extreme cases, loss of life all are consequential loss to humankind.

Urban areas are centres of economic activities with vital infrastructure which needs to be protected. Major cities in India have witnessed loss of life and property, disruption in transport, power and incidence of epidemics. These may include direct contamination of homes and other areas, contamination of drinking water sources with either infectious or chemical material or disruption of sewage systems. The damages caused by floods in Mumbai 2005 and Chennai 2015 are unforgettable examples and we need to build on contextual and specific strategies based on these.(10,16-21)

The good lessons learnt by the team: Target of picnic: It was instructed by authorities that those rendered homeless should feel as if they have come for a Picnic and enjoy this time rather than being upset. This is an example of strong political will. Use of safety jackets while on boat during evacuation was reported. The Covid protocol was strictly followed.

Take home message and the way forward: Disaster preparedness has to be strengthened in terms of list of people and addressing their awareness and capacity to mitigate future disasters. This study has shown the actual difficulties faced and provided suggestions for the same. The State Irrigation Department has, with the help of UP Remote Sensing Application Centre (RSAC-UP), has started using satellite data for mapping and flood hazard zoning in flood prone eastern districts. So in future it will be utilized for effective Disaster Management.

Conclusion

The biggest challenge was to identify the beneficiaries as reported by majority of nodal, because a lot of such affected areas are occupied by manual labourers, daily earners and students from nearby districts. Whenever there is something given for free, they have a special inclination, therefore in normal times the documentations shall be strengthened with the view of managing such situations in the future.

Recommendation

In developing countries the urban flood management needs to undergo a lot of metamorphosis and we need more such researches from the public health experts to formulate strategies for sustainable urban floods management.

Relevance of the study

The incidence of urban flood disaster is increasing day by day both in number and intensity of damage due to various reasons including climate change. Even the damage caused by them are increasing thereby an in-depth understanding of such activity is crucial for developing a sustainable, strategic public health approach towards such disasters in future.

Authors Contribution

AT: Conception, design and accusation of data and drafting of the manuscript and final approval to the published version. KP: Conception and design, and final approval of the version. SKS: Data analysis with interpretation and critical review of the manuscript for important intellectual content and approval of the final version. MM: Data analysis with interpretation and critical review of manuscript and final approval of the version.

Acknowledgement

We are highly obliged to the District Disaster Cell Prayagraj for their cooperation and support in conducting this research activity.

References

1. National Disaster Management Guidelines- National Disaster Management Information and Communication System (NDMICS) 2011.A publication of the National Disaster Management Authority, Government of India ISBN: 978-93-80440-12-5, February 2012, New Delhi
2. National Disaster Management Guidelines: Management of Urban Flooding. A publication of the National Disaster Management Authority, Government of India. ISBN: 978-93-80440-09-5, September 2010, New Delhi.
3. Han J, He S. Urban flooding events pose risks of virus spread during the novel coronavirus (COVID-19) pandemic. Sci Total Environ. 2021;755(Pt 1):142491. doi: 10.1016/j.scitotenv.2020.142491. Epub 2020 Sep 23. PMID: 33011594; PMCID: PMC7510583.
4. Slobodan P. Simonovic, Zbigniew W. Kundzewicz, Nigel Wright. Floods and the COVID-19 pandemic—A new double hazard problem. WIREs Water. 2021;8:e1509.
5. Ilan kumaran Kaliamoorthy, Mettu Srinivas Reddy, Akila Rajakumar, Joy Varghese, Sanjay Pandey, Balaji Pillai, Jothi Clara J. Micheal, Ravindranath Kancherla, and Mohamed Rela, Safe emergency evacuation of a Tertiary Care Hospital during the “once in a century” floods in Chennai, India. Indian J Crit Care Med. 2016 Feb; 20(2): 104–108. doi: 10.4103/0972-5229.175933
6. V. T. Krishnadas Menon, Jenyz M, Kerline P. J, Vidhu J and C. R. Saju. Study of morbidities in a flood relief camp: observations from kerala 2018. European journal of pharmaceutical and medical research. ejpmr, 2018,5(11), 443-445

7. Singh G, Hasan F, Kasi S. Medical Relief Camps in Flood Disaster-affected Area: Experience in Jammu and Kashmir. Int J Sci Stud 2016;4(5):60-64.
8. Euripides Euripidou and Virginia Murray, Public health impacts of floods and chemical Contamination, Journal of Public Health vol. 26, No. 4, pp. 376–383, DOI: 10.1093/pubmed/fdh163.
9. Integrated Flood Management Tools Series No.23 version 1.0. World Meteorological Organization, 2015
10. Narasimhan, Bhallamud, Mondal, ArpitaGhosh, Subimal, Mujumdar, P. 2016/05/01, Chennai Floods 2015 : A Rapid Assessment
11. Sally Thorne, RN.Evid Based Nurs: School of Nursing, University of British Columbia Vancouver, British Columbia, Canada doi: 10.1136/ebn.3.3.68 on 1 July 2000. Available at http://ebn.bmj.com/ India:BMJ-PG
12. https://prayagraj.nic.in/geography last accessed on 19/05/2022
13. https://timesofindia.indiatimes.com/city/allahabad/flood-fury-situation-in-prayagraj-grim-brings-back-1978-memories/articleshow/85225458.cms last accessed on 11.5.2022
14. Dell D. Saulnier, Claudia Hanson, PorIr, Helle Mölsted Alvesson and Johan von Schreeb. The Effect of Seasonal Floods on Health: Analysis of Six Years of National Health Data and Flood Maps. Int. J. Environ. Res. Public Health 2018, 15, 665; doi:10.3390/ijerph15040665
15. Manju Mohan, Yukihiro Kikegawa, B. R. Gurjar, Shweta Bhati, Anurag Kandya, Koichi Ogawa. Urban Heat Island Assessment for a Tropical Urban Airshed in India. Atmospheric and Climate Sciences, 2012, 2, 127-138 http://dx.doi.org/10.4236/acs.2012.22014 Published Online April 2012 (http://www.SciRP.org/journal/acs)
16. Alderman, Katarzyna, Turner, Lyle, & Tong, Shilu (2012) Floods and human health : a systematic review. Environment International, 47, pp. 37-47.
17. https://www.pressreader.com/ last accessed on 18 June 2022
18. https://www.hindustantimes.com/cities/others/flood-water-recedes-from-many-localities-in-up-s-prayagraj-101628966827710.html last accessed on 18 June 2022
19. https://timesofindia.indiatimes.com/city/allahabad/receding-flood-water-leaves-squalor-and-stench-behind/articleshow/85413635.cms last accessed on 18 June 2022
20. https://www.amarujala.com/photo-gallery/uttar-pradesh/allahabad/flood-in-prayagraj-fall-in-water-level-of-both-rivers-but-danger-remains last accessed on 18 June 2022
21. Muttarak R, Dimitrova A. Climate change and seasonal floods: potential long-term nutritional consequences for children in Kerala, India. BMJ Glob Health 2019;4: e001215. doi:10.1136/bmjgh-2018-001215

Tables

TABLE 1 HIGHLIGHTS OF THE 3 PHASES OF URBAN FLOOD RELIEF

Phase I Before Start of Camp 5th August onwards	Announcements by teams in prone areas for moving to safe place/camps. Evacuation started by NDRF, SDRF & CD
Phase –II **Operation of Relief Camps** **9th-15th August 2021** ***Danger mark (84.74m) crossed***	Evacuation completed Registration of people, Food distribution, Medical facility Recreational facilities for children, NGOs involvement Aerial Survey & Officials visit
Phase – III **After the Closure of camp** **Beyond 15th August**	Distribution of Flood relief Kits Preparation to prevent Epidemic

TABLE 2 SUGGESTIONS FOR THE DIFFICULTIES IDENTIFIED IN URBAN FLOOD RELIEF

The difficulties identified	Suggested Remedies
No training conducted before duty this year	Plan training by experts every year in July to train the new nodal officers
Registration of beneficiaries based on ID proof, difficult to segregate. Students were not included	A detailed list of residents of vulnerable areas could be prepared beforehand.
Low awareness among people, regarding do's and don'ts in flood and even for staying in such camps	Paramedical students, NGOs for community development should be roped in to make people aware and empowered.
Few people were not willing to move from camps when water receded (facilities were better than their home)	Resident welfare groups should be created in all flood prone areas to ensure responsible behavior of citizens
Difficulty in going to workplace	This issue should be discussed with district authorities for relief
***Mallahs* family living on their own boats for its safety, taking all risks.**	They were more concerned about their boat as it is their source of living. Enhancement of security is needed to assure them before they move to camp.