

## Flood in Pakistan and Infectious Diseases - The Way Forward

Natural disasters are calamities that take origin from geologic, hydrologic, and/or atmospheric sources as defined by the World Health Organization (WHO).<sup>1</sup> These calamities can occur in form of flooding, tropical cyclones, volcanic eruptions, drought, and/or earthquakes.<sup>1</sup> Not only do natural disaster cost people their lives, but it also damages the infrastructure, crops, and live-stock, costing billions of dollars in economic losses.<sup>2</sup> Moreover, the survivors become the most vulnerable population as they lose shelter, become susceptible to deadly disease outbreaks and cannot gain access to the basic necessities of life.<sup>1</sup> The WHO states that low- and middle-income countries (LMICs) suffer the most when struck by a natural calamity due to weak infrastructure, delayed rescue system and poor disaster management.<sup>1</sup> Water-borne disease epidemics become a major problem in disaster-stricken areas as the drinking water supplies become contaminated.<sup>1,3</sup> Water-borne illnesses are also reported as the major cause of death in disaster and camp settings.<sup>3</sup>

Pakistan faced torrential rains in 2022 that caused flooding in different parts of the country with over 33 million people being affected.<sup>4</sup> It has been estimated that over 2000 healthcare facilities were destroyed.<sup>5</sup> About 650,000 pregnant females had no access to obstetric care or birthing facilities, and over 4 million children were devoid of the basic healthcare needs.<sup>5</sup> Outbreaks of diarrhoeal illness and vector-borne diseases were on a rise.<sup>4,5</sup> A total of 3.6 million suspected cases of malaria had been reported in 2022 compared to 2.4 million cases reported in the previous year.<sup>4</sup> As of 20<sup>th</sup> September 2022 alone, 1,900 acute watery diarrhea cases, 200 malaria cases and 50 dengue cases were reported from different parts of the country.<sup>4</sup>

There are clear guidelines by the WHO to curb the spread of such diseases. Firstly, the focus has been laid on disease surveillance to identify the most common communicable diseases, disease incidence, and disease source by Integrated Disease Surveillance and Response (IDSR).<sup>4</sup> Mass distribution of insecticidal nets must be initiated to protect the survivors from dengue and malaria along with spraying of insecticides near the breeding ground of mosquitoes.<sup>4</sup> Rapid diagnostic testing for diseases like malaria and availability of medicines to treat the diseases can help identify and cure them in a timely manner.<sup>4</sup> Evacuation of survivors to safe shelters with availability of clean drinking water and health supplies in a timely manner can further help in management of diseases to save the community from any upcoming unpredictable circumstances.

Furthermore, appropriate planning measures are needed in consideration of the factors that cause losses due to massive flooding. A multi-faceted approach to mitigation should be considered. The most effective approach is to forbid new construction on flood plains, flood-proof existing buildings, or remove current development and replace it with another use of the land. Building defensive structures/barriers like flood storage facilities and divert waterways to other watersheds or side channels storage or dams, building storm drains to move water to surrounding areas to be protected,<sup>6,7</sup> are all the measures that need to be taken.

Developing a flood forecasting programme improves all other flood mitigation measures. Forecasts provide the community the required lead-time to execute a number of preventive activities. By evacuating people, personal belongings, crops, animals, and machinery, as well as by making short-term attempts to strengthen the capacity of structural measures such as sandbagging operations and flood control operation at dams, actions may be taken to prevent the loss of life and economic damages. Long-term investments and policies are required in order to ensure that the community is ready to respond to the fairly rare occurrence of the disaster such as floods, rains, and earthquakes.<sup>7</sup> This can be done by strengthening the early warning system including access to information to the general public.

Individuals should raise their homes above the projected flood levels and dry and wet floodproofing measures need to be implemented within households. Dry floodproofing techniques in particular are meant to prevent water from entering a building/house during massive floods, while wet floodproofing methods can minimise the damage after water has entered the house.<sup>8</sup>

To successfully reduce the damage caused by floods, social and economic factors are equally crucial and must be considered. Disasters in developing nations can essentially erase the infrastructure investments made over the last 50 years,<sup>6</sup> highlighting the need of using sustainable techniques including land use planning to avoid construction of residential, commercial, and industrial buildings on flood-prone area. Governments must incorporate the impact of disasters into their financial planning and projections for the economic growth. Moreover, population-based surveys should be conducted to assess the actual impact of flooding. This will help the government to understand the connections between investments in flood disaster management and long-term social and economic stability through good long-term fiscal planning.

### COMPETING INTEREST:

The authors declared no competing interest.

### AUTHORS' CONTRIBUTION:

AK: Suggested the topic and provided the critical feedback and direction to the team.

NAA, FK: Created the first draft.

All authors reviewed the final manuscript.

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Received: December 30, 2022; Revised: March 03, 2023; Accepted: March 13, 2023

DOI: <https://doi.org/10.29271/jcpsp.2023.09.1080>

