

Letter to the Editor

Challenges and successes in the prevention and control of infectious diseases after March and April 2019 floods in Iran

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To the Editor—Floods are the most common type of the natural disaster globally. This water invasion causes the loss of US\$36.3 billion annually and is responsible for almost half of all victims of natural disasters.¹ Among natural disasters in 2018, flooding affected the most people, accounting for 50% of the total affected and causing 2,879 total deaths.^{1,2} Also, 79.8% of flood events occurred in Asia, mostly across Bangladesh, India, Myanmar, and Nepal.^{1,2} Iran has also experienced many devastating floods, but the flood that occurred during March and April 2019 was the biggest natural disaster in the previous 15 years.³ This flood affected 28 of 31 provinces, especially Lorestan, Golestan, and Khuzestan, as well as >2,000 cities and towns. According to the Iranian Red Crescent aid organization, heavy rains and flash floods affected ~10 million people, destroyed >500,000 homes, injured >20,573 Iranians, and caused at least 84 deaths.^{4,5} One of the main concerns in flooding is the outbreak and prevalence of infectious disease.

Waterborne diseases, including gastrointestinal (GI) disease, occur in environments with poor hygiene and inadequate clean drinking water after a flood. Cholera is the most prevalent GI disease that occurred after floods in Bangladesh⁶ and Mozambique,⁷ and salmonellosis, shigellosis, and cryptosporidiosis have also been reported after floods. Viral GI disease from norovirus and rotavirus, and hepatitis A and E in Sudan⁸ and India⁹ have also been reported as outbreaks following floods. Respiratory infections during the 2005 floods in England¹⁰ and skin infections following the 2005 floods in Thailand¹¹ are others. The vectorborne diseases, such as leishmaniasis and malaria, have been prevalent after floods in the Dominican Republic, Peru, and Pakistan.¹² Leptospirosis caused an outbreak after a flood in India in 2005.^{13–15} Hantavirus pulmonary syndrome, dengue (Peru in early 2017¹⁶), yellow fever, and West Nile fever have also been prevalent vectorborne infections following floods.^{17,18} After most floods, outbreaks of infectious diseases are inevitable.

However, according to the Iranian Minister of Health and Medical Education, there were no noticeable outbreaks reported after Iran's 2019 flood.¹⁹ So the questions are these: why and how? Many factors contributed to the absence of an outbreak of infectious disease after the massive 2019 Iranian flood^{3,5,17–20}:

1. Monitoring and controlling the drinking water continuously (chlorination and boiling of water) during and after flood
2. Proper disposal of waste and sewage in flooded areas

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3. Monitoring and providing healthy food and drugs continuously
4. Controlling the toilet and bath hygiene in affected areas and camps
5. Proper handling and disposing of animal corpses lost in the flood
6. Use of chemical pesticides to eliminate vectors such as insects and rodents
7. Vaccination of high-risk groups
8. Health education for people living in flooded areas
9. Establishing mobile healthcare clinics
10. Presence of armed forces and volunteers in the flooded areas early in the flood event
11. Humanitarian aid from Iranian people, international organizations, and other countries.

Although Iran was successful in controlling the potential outbreaks after the 2019 flood, it faces many challenges that will continue to be troublesome following future flood events. These challenges include (1) lack of precise prediction and appropriate management before, during, and after the flood; (2) inadequate health facilities, equipment, and medicines; (3) mountainous areas that lack enough roads, bridges, and related infrastructure in many flood-prone areas, especially in villages, which interferes with healthcare workers; (4) destruction of healthcare facilities and hospitals in many affected areas; and (5) low health knowledge of people living in flood-affected areas, especially in low-income and rural areas.^{4,5,17}

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