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Editorial

Pakistan floods: Incidence of vector- and water-borne infectious diseases soars

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Another year bears witness to a novel humanitarian disaster that is linked to extreme weather events seemingly associated with climate change [1]. This time it is in Pakistan, the South Asian nation of 220 million people. Record-breaking monsoonal rains started in mid-June 2022, which have been attributed to a La Niña oceanic and atmospheric phenomenon. This compounded the glacial melts of April and May in the northern Gilgit-Baltistan and Khyber Pakhtunkhwa regions that had caused an already swollen Indus river system that runs the length of the country [2]. More than 33 million residents have been affected by the ensuing devastating floods that hit the south-eastern province of Sindh. There, the rainfall in August was 726% higher than the average since records began in 1961 [1]. The neighboring south-western Baluchistan province is also extensively affected. Satellite images show that around one-third of Pakistan is underwater [3]. From late August 2022, Pakistan's public health system has been creaking under the enormous burden of clinical cases that has arisen [4,5]. The suddenness and severity of the emergency has highlighted the national authority's inadequate disaster planning and first responder mobilization [6].

Unprecedented flooding

The immediate toll from the most severe flooding in Pakistan's recent history is more than 1,600 dead, principally from drowning as around 1.7 million houses were washed away, leaving close to 8 million people displaced [1,7]. Thousands of villages remain submerged, leaving countless families homeless and without crops and livestock. Moreover, unsealed roads in many remote communities are still inundated, impassable or eroded, so access to emergency medical care is extremely limited. As rescue and evacuation efforts continue several weeks into the crisis many displaced people have no choice but to live near stagnant water, sleeping either in the open or under makeshift shelters [4,7]. This brings a secondary threat, that of transmission of vector- and water-borne infectious diseases. To date, a total of 2.3 million patients have been treated in the field and or mobile hospitals set up in the flooded region [4].

Infectious disease outbreaks

Public health experts are starting to report a surge in incidence of the mosquito-transmitted dengue and malaria, as well as severe gastrointestinal infections such as cholera and typhoid. Notably, dengue and malaria are already claiming lives and

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confirmed cases are increasing daily, now each into the tens of thousands [5,8]. However, even this may be a conservative estimate in such an under-resourced situation. The accurate diagnosis of febrile illness is not a priority, many suspected cases go untested, and testing laboratories are overwhelmed. Over 90,000 diarrhea cases, mainly in children, were reported from Sindh in just one day at the start of September, according to provincial government health officials [4].

Looming threat of polio

An added public health concern is the potential for resurgence of the enteroviral disease poliomyelitis in a country that is one of the last endemic strongholds of wild poliovirus. Following the previous major floods in 2010, by November of that year Pakistan accounted for over 60% of all global incidence of poliomyelitis, with most new cases coming from flood-impacted areas [1]. When people displaced by flooding are drinking untreated water that is contaminated by human feces there is a heightened risk of direct or indirect fecal-oral transmission of this highly infectious virus. The public health system in Pakistan is so overstretched at present that monitoring floodwater as an epidemiological surveillance measure for poliovirus is not a priority.

This concerning scenario is aggravated by reported cases of poliomyelitis emerging in other nations from which it was considered eradicated [9]. This is due to the circulation of mutated oral vaccine-derived poliovirus, which has caused recent outbreaks in more than 20 geographically distinct countries among under-vaccinated communities. The World Health Organization considers that there is a continued high risk of international spread of poliovirus due to waning immunity, surveillance gaps and large-scale population migration [9]. There will be even more need to step up polio eradication efforts in the post COVID-19 pandemic era to protect against the spread of both wild and vaccine-derived strains of the poliovirus.

Vulnerable populations

As is commonplace for outbreaks of emerging and re-emerging infectious diseases associated with climate change, the impact is disproportionately felt by the most vulnerable groups in society. That is, those Pakistanis who are already marginalized by virtue of displacement, poor sanitation, insufficient food, and lack of potable drinking water. There are also concerns for Pakistan's 1.3 million registered Afghan refugees. An estimated 800,000 persons already displaced from their neighboring homeland by conflict, violence and poverty live in relief sites in over half of the 80-plus severely flooded districts [1,7].

The United Nations Children's Fund (UNICEF) noted that at least 16 million children have been affected, more than 3 million of whom were in need of humanitarian assistance and stood at heightened risk of diseases, drowning and malnutrition. Officials in Sindh predict that it may take several months before water levels recede sufficiently for the long-term recovery process to start in the worst-hit areas [7].

Health inequities

People in high climate vulnerability conditions, including South Asia, are 15 times more likely to die from climate impacts compared to citizens of more stable climatic environments. This impact close to half of the world's population that live in low- and low-middle income countries in tropical zones [10]. Given the inequitable repercussions on human welfare, there is an unfortunate but not unsurprising irony of disaster risk reduction that the majority of global research on climate change focuses on geographical regions – temperate zones containing high-income countries – where the threat of emerging infectious diseases is least likely to occur [11]. This reflects the socio-economic inequity between the affluent nations of the Global North, mainly the G20 states, and the politically and culturally marginalized countries of the Global South, of which Pakistan is one.

Emergency relief

Despite the efforts of the Pakistan Government and local and foreign relief organizations, many people are in dire need of food, shelter, medical assistance, and medicines. The country's prime minister, Shahbaz Sharif, sought the attention and help of world leaders at the UN General Assembly where he outlined the devastation caused by the record-breaking floods [12]. Angelina Jolie, the Hollywood actor and special envoy of the UN Refugee Agency, has toured the worst-affected areas of the country with international aid organization International Rescue Committee in an effort to raise awareness [12]. The damage to community infrastructure is initially estimated at $US30 billion [3]. With Pakistan's already weak health system and lack of support, displaced families have complained of being forced to drink and cook with unsafe water. Authorities and aid workers have said more

immediate help is needed for displaced families exposed to swarms of mosquitoes and other hazards such as snake and dog bites [5].

Natural disaster planning

In the immediate future, further challenges await Pakistan's displaced flood victims. Unfortunately, due to the sheer volume of water run-off there is not much that can be done right now to reduce mosquito populations, so it is critical that people take adequate precautions to prevent being bitten [8]. Anywhere there is shallow, pooling water provides an ideal habitat for mosquitoes. Moreover, mosquitoes can fly tens of kilometers, especially if assisted by wind. Dengue virus can survive in mosquito eggs on the edge of floodplains or even in those mosquitoes that survive in the winter months in very low numbers. Thus, long after floodwaters have eventually subsided, the threat of vector-borne diseases will persist [7,8].

Conclusion

It is, of course, not possible to prevent natural catastrophes from happening; floods, tsunamis and earthquakes are all considered an 'act of God'. Yet, the international community can aim to achieve climate-resilient reconstruction of affected areas and to reduce the threat of climate-sensitive vector- and water-borne infectious diseases. In looking to mitigate public health, social and economic impacts of extreme climatic events, such as those endured in Pakistan, coordinating early warning, emergency response and long-term recovery efforts is required.

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