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Public health implications of severe floods in Pakistan: assessing the devastating impact on health and the economy

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Natural disasters, including droughts, earthquakes, landslides, and floods, cause human mortality, property destruction, and social and economic turmoil. More than 33 million people in Pakistan have been impacted by floods due to the recent heavy rains. Many public hospitals, water treatment plants, and educational institutions have also been damaged or destroyed. Water and vector-borne diseases may have spread more widely due to the floods. A rapid health emergency response must be initiated to treat the injured, stocking healthcare facilities with vital supplies and back up mobile health teams in the impacted areas.

KEYWORDS

public health, infectious outbreaks, disastrous flooding, Pakistan, humanitarian crisis

Introduction

Natural disasters, such as droughts, earthquakes, landslides, and floods, are catastrophic events caused by atmospheric, geological, and hydrological changes that cause human deaths, property destruction, and social and economic upheaval (Watson et al., 2007). The increasing frequency of natural disasters around the world significantly impacts community health and wellbeing. Its consequences can be felt immediately, in the form of fatalities caused by injuries, or later, due to the localized spread of infectious diseases. Natural disasters may become catastrophic when populations are unable or unwilling to adapt. While disaster risk management mitigates the effects of natural disasters in wealthy countries, preventive efforts are not prioritized in developing countries. This lack of prioritization results in infrastructure damage and the diversion of already limited funds toward post-disaster rebuilding, further exacerbating the situation (Doner and Rodríguez, 2011). Natural disasters are often followed by a wave of water-, food-, and vector-borne diseases. The 2004 diarrheal outbreak in Bangladesh, which sickened over 17,000 people following a series of devastating floods, wherein *V. cholerae* and *E. coli* were identified as the causative agents of diarrheal illness, is an example of how a natural disaster may foreshadow a vector-borne illness. (Kouadio et al., 2012). According to the China Report on Health and Environment Change, climate change has made China 37% more susceptible to dengue fever over the last half-century (2020) (Cai et al., 2021).

Pakistan's varying topography and climate

Pakistan is home to a wide range of landscapes and climates. It has temperature swings from -20°C to 51°C , with monsoons and floods one time and heat waves the next. Rising global temperatures and climate unpredictability are exacerbating Pakistan's already severe flood issues (Countrystudies, 2022; Memon and Ahmed, 2022). The Federal Flood Commission recorded 20 significant floods in Pakistan since 1950. The majority of these floods occurred in the last decade. Among those floods, the 2010 flood was the deadliest on record, claiming over 2,000 lives and affecting over 20 million people (Kirsch et al., 2012). Even after such devastation, no precautions were taken to safeguard against future floods. Flood effects could have been mitigated by government initiatives in smart land use management by protecting natural drainage patterns and deploying green infrastructure.

Recent floods and their repercussions

This year, Pakistan was afflicted by more flooding than usual because of the country's prolonged heat waves in May and June, which caused the atmosphere to contain more moisture than usual (about 6–7 percent more moisture for every degree increase in atmospheric temperature). The quick ascent of hot air exacerbated the monsoonal "thermal low," a low-pressure system that aided in transporting moist air to southern Pakistan (World Weather Attribution, 2022). It hastened the melting of seven thousand glaciers, flooding Pakistan's water systems. A total of 243% above average precipitation fell in June and August (National Weather Forecasting Centre and Islamabad, 2022). A third of Pakistan was flooded, including large portions of Sindh, Balochistan, and southern Punjab. This corresponds to 116 of Pakistan's 154 districts being affected. The Latest WHO Floods Situation Report estimates that over 1,290 people have died and nearly 12,500 have been injured. More than 33 million people have been impacted, with over 6.4 million needing emergency assistance (WHO EMRO, 2022).

Furthermore, the economy has been significantly affected by the recent floods in Pakistan. Early estimates from Planning Minister Ahsan Iqbal indicate that the flood damage exceeds \$10 billion. Pakistan is primarily an agrarian society, with the agricultural sector contributing 21.9% to the GDP and employing 45% of the total workforce either directly or indirectly. The extensive destruction of agricultural land due to the floods has resulted in a food crisis, further exacerbating the country's already fragile economy and causing a decline in the GDP growth rate from 5% to 3%. Economists anticipate a rise in poverty and unemployment from 21.9% to over 36%, along with a projected inflation rate of 30% for the current fiscal year. This financial crisis could have been mitigated if the government had implemented comprehensive financial planning and maintained appropriate insurance coverage.

Flood-caused health catastrophe and suggestions

Mobile medical units and increased access to medical treatment

The Pakistani healthcare system has faced significant challenges, compounded by the high prevalence of infectious diseases such as hepatitis C, affecting approximately one in every 20 individuals in the country, placing Pakistan as the second-largest global hotspot for HCV infections. (Mahmud et al., 1186). Moreover, the healthcare system has been further overwhelmed since the COVID-19 outbreak in January 2020, leading to a year-long nationwide shutdown and an estimated loss of approximately 30,656 lives. (WHO, 2020). The recent floods have exacerbated the already dire health situation, causing severe damage to 1,460 medical facilities, destroying 5000 km of roads and 243 bridges disrupting transportation networks, hindering access to healthcare services for the affected population. To address this we believe that setting up mobile medical units in the affected areas can provide timely and efficient medical care to those who need it the most. These units can include medical personnel, equipment, and supplies necessary to provide basic medical care. Healthcare workers in flood-affected areas may need additional training and resources to respond to the specific health needs of the community and to deliver high-quality care.

Sanitation infrastructure and hand hygiene

Recent flooding served as the medium of spreading diseases like cholera, dysentery, dengue fever, malaria, polio, and skin infections (WHO EMRO, 2022). Health officials recorded a surge in dengue and malaria cases in Sindh as of 15 September 2022, with a 40% positive ratio, 3,830 cases, and 9 fatalities (Geddes, 2022). Before the floods, 290 confirmed cholera cases had already been recorded from Sindh, Balochistan, and Punjab (Disease Outbreak News, 2022). The prevalence of diarrheal disorders has risen to the point where they account for 40% of all deaths in disaster zones and camps due to overcrowding and water pollution by feculent material and hazardous substances (Al Jazeera, 2022).

Mitigating the spread of diarrheal diseases after floods requires a multi-pronged approach including promoting hand hygiene by providing access to soap and water or hand-sanitizer can make it easier for people to practice good hand-hygiene. Moreover, ensure access to safe drinking water by providing bottled water or water purification tablets to affected communities. Additionally, installing temporary latrines in affected areas and improving the sanitation infrastructure in the long term. People affected with such diseases should receive prompt treatment including oral rehydration solution (ORS) to people who are dehydrated and antibiotics to people with severe cases of diarrhea to limit the spread. Furthermore, it is crucial to build disease surveillance and response systems that can assist health authorities in identifying, and once it is detected, a response plan that includes measures like quarantine, treatment, and contact tracing must be implemented.



FIGURE 1

A flooded area after heavy monsoon rains in Charsadda district in Pakistan's Khyber Pakhtunkhwa province on Aug. 27, 2022. Charsadda is one of many Pakistani areas hit hard by floods in past years as well.

Vaccinations

The rapid spread of diseases, including polio, measles, leishmaniasis, HIV, and COVID-19, easily preventable by vaccination, is also a significant cause for alarm. Before the recent flooding and rain, Pakistan has already seen 4,531 cases of measles and 15 cases of in review wild poliovirus this year (UN News, 2022). The province of Sindh recently announced 10 new instances of diphtheria, even though the illness has previously been eliminated across Pakistan and its resurgence is even more concerning (Daily Times, 2022). These figures will undoubtedly rise further due to the disruption in vaccination campaigns.

Initiating a vaccination program after floods can be a challenging task but can be made easier by adapting the following suggestions. Firstly, conducting a needs assessment to identify vaccines that are most needed and the populations that are most at risk.

Secondly, setting up mobile vaccination teams can be an effective way to reach populations in remote areas by recruiting additional healthcare workers, training them in vaccine administration, and deploying them to flood-affected areas. Its acceptance will grow with the implementation of health education initiatives that raise awareness of the advantages of vaccination, the dangers of infectious diseases, and the availability of vaccinations.

Natal and antenatal care

The most vulnerable victims of the floods have been identified as women and children. The United Nations' reproductive health office forecasts that as many as 73,000 women will give birth in September to almost 650,000 pregnant women living in flood-affected areas of Pakistan (UNFPA Pakistan, 2022). Pregnant women flood victims are

significantly under threat of Hepatitis (A and E) and nutritional deficiencies. With less access to medical treatment, Pakistan's already high maternal death rate is expected to rise further due to unsafe deliveries during recent floods. More than 3 million children need humanitarian aid and are at risk of waterborne infections, drowning, and starvation, UNICEF said (ReliefWeb, 2022).

A comprehensive approach that prioritizes prevention, early detection, and prompt therapy is needed to lower the morbidity/mortality rates for expectant mothers following floods. We suggest setting up temporary delivery facilities in affected areas and ensuring that the nearest local health clinics in areas unaffected are fully operational to provide access to antenatal care and safe delivery services. It is crucial to provide medical supplies including sterile equipment, antiseptics, and wound dressing to treat any potential wounds or infections, in addition to carrying prenatal vitamins, iron, and folic acid supplements. Figure 1 shows A flooded area after heavy monsoon rains in Charsadda district in Pakistan's Khyber Pakhtunkhwa province on Aug. 27, 2022.

Conclusion

More than a century of burning fossil fuels as well as unequal and unsustainable energy and land use has led to global warming of 1.1°C above pre-industrial levels. Every increment of warming results in rapidly escalating hazards. More intense heat waves, heavier rainfall, flooding and other weather extremes further increase risks for human health and ecosystems. When the risks combine with other adverse events, such as pandemics they become even more difficult to manage especially in under-developed countries such as Pakistan. Therefore, it is essential to adopt the above-mentioned methods of risk reduction.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

MR: writing—original draft, final approval and agreeing to the accuracy of the work. AF: writing—original draft, final approval and agreeing to the accuracy of the work. UH: conceptualization, writing—original draft, final approval and agreeing to the accuracy of the work. HS: writing and editing the final manuscript. All authors contributed to the article and approved the submitted version.

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