

Health Impacts Of Flood Disasters: An Evidence From Pakistan

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Abstract

Climate creates tumultuous environmental conditions with dire health outcomes. Every year, floods and harsh weather conditions lead to significant morbidity and mortality worldwide. Floods increase mortality rates and pose challenges to the health of survivors. This study seeks to determine the vulnerability and health impacts of these catastrophic floods by analyzing injury, mortality, and illness patterns. Our systematic review of 30 research articles evaluated health sector conditions during floods and extreme weather events. The findings show a significant impact of flooding on human health. The study found immediate impacts from flooding are usually due to injuries, infections, and disruption to health services. Floods heightened the risk of disease outbreaks, including fever, dengue, pink eye, hepatitis E, leptospirosis, and gastrointestinal illness, particularly in unsanitary and displaced populations. A recent systematic review concluded that the physical illness of flood survivors is often compounded by psychological distress and mental health issues. To address the effects of flooding on human health in a sustainable manner, this study suggests new policy measures that will improve the efficacy of the existing flood coping techniques.

Keywords: flood, health, climate, illness, risks, deaths.

INTRODUCTION

Climate change poses the most significant global challenge (Adams and Luchsinger, 2009). Climate change threatens global sustainability, especially in rural communities of developing countries. The serious effects of climate change have just become apparent in Pakistan. Over the past ten years, extensive flooding in the Indus River system has resulted in significant damage. (Ajani and Van, 2021). Regardless of one's geographical or financial background, it has multifaceted impacts on our society, affecting crucial aspects such as food production, access to water, health, habitat, and biodiversity (Adams and Luchsinger, 2009). The consensus among

world climate scientists and activists is that these changes are human-induced (Caney, 2012). Unfortunately, experts predict that some climate changes may be irreversible, and their catastrophic effects could severely impact the well-being and livelihoods of vulnerable communities worldwide (Crowther et al., 2016; Gardiner, 2004). Floods, in particular, pose unprecedented challenges to human health and can result in severe consequences such as loss of human lives and social damage. Furthermore, political factors exacerbate the risk of health damage to communities affected by floods. The prevalence of extreme weather conditions and inadequate urban policies regarding floods has

heightened global sensitivity to the issue. Therefore, floods present critical social and political challenges and pose serious risks to human health. The Himalayan region is home to vast glaciers, but with rising average temperatures, the area faces constant threats. Although the rainy season is currently the primary cause of floods, floods remain the most frequent natural disaster in the region, with a recurrence rate of 40% (Chaudhry, 2017). Pakistan is one of the countries most affected by the impact of rising temperatures, causing significant harm to people in various parts of the nation. The effects include flash floods caused by extensive glacier melting, a particularly intense monsoon season, increased heatwaves, water scarcity, rising sea levels, food shortages, and drought in some regions of Southern Sindh, leading to the displacement of people. Moreover, the land adjudication and administration system in Pakistan is colonial, lacks judicial augmentation, and provides an opportunity for flawed urbanization (Shafi et al., 2022). According to the scientific community, floods are the primary contributor to poor health and major health issues, particularly in poorer regions (Fox and Sheehan, 2019). Climate change creates unpredictable environmental circumstances that have detrimental effects on human health. Each year, a significant number of individuals suffer from severe illnesses, and floods increase the death rate and pose health problems for survivors. As such, the devastating effects of floods are a global issue that requires international collaboration to mitigate (Bell, 2011). The contribution of every individual is vital during these times of climate change. However, the pertinent question remains: what type of evaluation and planning is necessary? (Lockie, 2017).

REVIEW OF LITERATURE

Flood damages and health risks from 2003 to 2022

Pakistan has experienced large and small natural disasters since its inception. These disasters included floods, earthquakes, windstorms, droughts, and more; these catastrophize destroyed the infrastructure, lives, livestock, livelihood, health, education, communication, business, and such like (Mahesar, 2022). Pakistan has the most glaciers outside of the arctic circle, making it one of the nation's most vulnerable to floods and other water-related calamities. The monsoon season and climate change have a big effect on socioeconomic decline and health. Many parts of Pakistan are affected by frequent flood calamities. When above-average monsoon rainfall caused flooding in Sindh Province in 2003, urban flooding also hit Karachi, where two days of 284.5 millimeters (11.20 in) of rain left the city in ruins. Thatta District, however, was the worst hit, with 404 millimeters (15.9 in) of rain causing flash floods there. At least 484 people died, and the province's 4,476 towns were damaged (Islamic Relief Worldwide, 2009; Monson, 2011). Khyber Pakhtunkhwa, Sindh, and coastal Balochistan suffered significant damage from monsoon rains in 2007. Khyber Pakhtunkhwa was disrupted by melting glaciers and severe rains in July and August, while Sindh and coastal Balochistan were affected by Cyclone in June and subsequent torrential rains in July and August. At least 2,000 people were evacuated from their homes and 130 people drowned in Khyber Pakhtunkhwa in July and August, while 815 people died in Balochistan and Sindh as a result of flash floods (Global Register of Major Flood Events, 2007). Pakistan is the third-most flood-affected country after Bangladesh and India, according to Shreshta (2008), who studied the flood history of South Asia. As record-breaking rainfall in Khyber Pakhtunkhwa and Punjab in 2010 produced major floods, it had an impact on nearly the whole country of Pakistan. More people were affected

by the flooding than by all of the Indian Ocean disasters combined in 2004. (Zaidi, 2010). Around 20 million people were affected by the flood, and at least 2,000 people died in it (Pakistan Flood, 2010). Although there were only a small number of direct deaths and injuries from the 2010 flood (1/10,000 impacted), indirect and long-term health issues were prominent, with 77% of families reporting flood-related injuries or illnesses (Kirsch, et al., 2012). Massive floods that swept over Sindh province in September 2011 as a result of monsoon rains resulted in at least 361 deaths, 5.3 million people being impacted, 1.2 million dwellings being damaged, and 1.7 million acres of agricultural land being destroyed (The Express Tribune, 2011). In September 2012, floods brought on by monsoon rains hit Khyber Pakhtunkhwa, southern Punjab, and northern Sindh. As a result, thousands of houses were destroyed, thousands of acres of agricultural farmland were ruined, and more than 100 people were killed (Dawn, 2012). Baqir et al. (2012) found that the incidence of several acute and subacute illnesses significantly increases following environmental disasters, including leptospirosis, skin and eye infections, diarrhea, leishmaniosis, malaria, and respiratory infections. In September 2014, due to massive rain, flooding affected Jammu and Kashmir as well as Punjab (The Express Tribune, 2014) Constituted flood situation in River Chanab and Jhelum (BBC, 2014). Traumatic injuries, chemical exposures, starvation, and mental health issues also rise during and after a flood catastrophe (Bandino et al., 2015; Daniel et al., 2021). According to Paavola (2017), severe climate conditions harm human health due to sensitivity and weather vulnerabilities. The impact of floods on public health is multifaceted, and they can have both acute and long-term effects on individuals and communities. The risk of infectious diseases increases as water sources become contaminated with sewage and other pollutants during floods. The inundation creates

numerous challenges for the healthcare industry, as it devastates various buildings and decreases their capacity and ability to function at full capacity. For instance, in flood-affected areas, medical centers and homes are destroyed, making it difficult for healthcare professionals to acquire the necessary equipment to serve the public. Furthermore, floods destroy crucial infrastructures, such as hospitals and healthcare organizations. According to Peel et al. (2018), floods damage buildings and infrastructure severely, which disrupts essential social activities and hinders efforts to improve poor health conditions. The impact of flooding on public health outcomes has been staggering, with approximately 2.3 million people affected worldwide over the last two decades. As 231 mm of rain fell in under 12 hours in August 2020, Karachi experienced the highest day of rain in recorded history. Only Karachi had 484 mm (19 inches) of rain in August 2020. For the past 90 years, this rainfall record is the highest. Many residential areas, including urban slums and villages in peri-urban regions, were severely affected by flooding caused by rainwater and overflowing water from nullahs and drains. This severely damaged the life of the residents. Much of Pakistan was flooded from June to August 2022. The worst-affected provinces were Balochistan and Sindh, although floods had also devastated other regions of the nation as far north as Kashmir. At least 1,500 people died in the flooding with 16 million children affected (Giskori, 2022; Ahmed, 2022). Floods of 2022 have caused unprecedented damage, affecting people's lives, property, and livelihoods on an unprecedented scale. The calamity was caused by the heaviest and most intense monsoon rains ever recorded, impacting one in seven individuals, or approximately 33 million people, and displacing nearly 8 million. Despite relief efforts, an estimated 15 million people are still at risk of flooding or living nearby. The flood has claimed more than 1,700 lives, with children accounting

for a third of the fatalities. As of October 11, government officials have declared 94 districts as "calamity struck," representing over half of all districts in the country. The majority of these districts are located in Balochistan, Sindh, and KP provinces (Pakistan Flood, 2022). The pandemic was the first significant natural disaster in the past three years, followed by floods. Both of these calamities have been poorly managed by politicians, causing challenges to human health and well-being (Rehman, 2022). Geddes (2022) reported that flooding in October destroyed or damaged 10% of Pakistan's healthcare facilities. This destruction has resulted in the loss of critical medical equipment and supplies. In a nation where half the population already lacks access to primary healthcare, the loss of over 2000 hospitals and healthcare facilities exacerbates the country's public health issues. In flood-affected regions, immunizers have adapted their practices to provide medical assistance while minimizing disruptions to polio vaccination efforts. Nevertheless, the lack of access to healthcare facilities and the displacement of numerous individuals increase the risk of disease transmission and impede immunizers' ability to reach unvaccinated populations. Meanwhile, political issues in Pakistan are a concern. Rehman (2022) demonstrated that politics in the country does not prioritize the well-being of ordinary citizens. The government's neglect of flood-related health issues in Pakistan is a stark example of how political factors impact the nation's healthcare sector. According to Pakistan Flood (2022), devastating floods serve as a reminder that systemic changes are necessary to address underlying vulnerabilities to natural disasters and how these vulnerabilities interact with other shocks. An urgent paradigm shift toward incorporating resilience to natural disasters in development planning and asset management is required at this stage. Floods can also exacerbate pre-existing health conditions, such as asthma and skin diseases, due to exposure

to environmental irritants and increased humidity (Khan, 2022). Pregnant women and girls are particularly vulnerable during floods, with much-lacking access to healthcare facilities and support needed to deliver their children safely (UNFPA, 2022). The challenges of mobility and migration in flood-affected areas further exacerbate the health risks faced by communities (Paavola, 2017). Floods have significant implications for public health, and it is crucial to address these issues in disaster management planning and response. Amidst the destruction of healthcare facilities and homes, many are uncertain about where and how to give birth. The healthcare sectors in developing countries suffer from the damaging effects of floods, which impede patients' access to essential health services (Shah et al., 2020; Winter et al., 2022).

Latif (2019) estimated that Pakistan had lost \$80 billion as a result of climate change disasters between 1996 and 2016 and found alarmingly, all four provinces Sindh, Punjab, Khyber Pakhtunkhwa (KP), and Balochistan. Families who were displaced by floods in these areas lacked proper shelter health and sanitation facilities (Salik et al., 2020). Women who are pregnant or menstruating are also in an awful situation since they cannot access bathroom facilities or menstrual supplies. Maternal health services are required since the research indicates that 73,000 of the 650,000 pregnant women in flood-affected areas are expected to give birth within the following month. In addition to those giving birth, the extensive harm done to the roads and communication networks makes it more difficult for people to attend clinics and hospitals. As a result, these obstacles must also be overcome by women and girls who want to obtain contraception and other reproductive health services

METHODS

To collect the data, we selected 30 authentic papers from various online databases and

websites, including Google Scholar, Web of Knowledge, Science Direct, and Scopus. The selected papers and reports were published between 2003 to 2022.

The authors gave particular attention to recent but well-referenced literature. The selection criteria for relevant literature were predominantly based on the following factors:

- a) peer-reviewed research papers published in impact factor-listed research journals;
- b) peer-reviewed scientific reports (on Flood) from world-renowned publishers;
- c) news reports and
- d) literature that used keywords such as flood, climate, health, social impacts, developing countries, and floods in Pakistan

DISCUSSION

Climate change caused environmental turmoil leading to severe health consequences. Worldwide floods and extreme weather cause significant morbidity and mortality annually. Pakistan has regular floods as a result of the country's intense monsoon rainfall. Any country would have struggled with floods of the extent and scope that Pakistan has seen in recent years. Due in part to limitations in present technology capabilities, such as warning signals, preparedness activities, disaster response, and systemic flood protection measures, recent major floods have demonstrated that there is a lack of appropriate collaboration amongst flood control organizations. Survivors face health challenges, and floods increase mortality rates. This study analyzed illness patterns to determine flood vulnerability and impacts. The systematic review of various articles and reports evaluated health conditions during extreme weather. Disease outbreaks occur in unsanitary and displaced populations, including fever, dengue, and gastrointestinal illness. Flood survivors suffer from psychological distress and mental health issues. Effective policies must prevent flood-related morbidity and mortality, based on our

systematic literature review. Catastrophic floods affect physical and mental health via bacteria, viruses, and pathogens. They cause diarrhea, cholera, dengue fever, and hepatitis E outbreaks. Mosquitoes and other vectors thrive in stagnant floodwaters. Chronic respiratory diseases, anxiety, and depression are long-term health impacts. Displaced people face more vulnerability as they lack clean water, sanitation, and medical care. Elderly, pregnant women, children, and pre-existing medical conditions make individuals more susceptible to floods. Certain populations, such as low-income communities in informal settlements, are more susceptible to the effects of floods due to a lack of basic services and living in flood-prone areas. Indigenous communities, migrant workers, and refugees are also at high risk due to limited access to services and legal protection. The findings of this study explored that in Pakistan, the key factor is extensive post-flood rehabilitation to prevent long-term negative impacts on health and economic development. Flooding causes infrastructure damage, productivity loss, and increased healthcare costs. Prioritizing the recovery of livelihoods and agriculture, the reconstruction of private homes, and the restoration of public health facilities and infrastructure, including roads, bridges, and schools, is crucial. To achieve this, a resilient recovery, rehabilitation, and reconstruction framework is needed. Pakistan requires an honest and inclusive participatory strategy that brings together the public and private sectors, academia, think tanks, and the global community around a shared objective. On the other side, it is important to prioritize vulnerable populations in disaster preparedness and response efforts. Effective policies and interventions can reduce the health impacts of floods and extreme weather events. This study has limitations to consider. Published articles are only used in the review, which may miss some flood-related health information. Quality of evidence can affect our findings. It

does not examine specific interventions and more research is needed. Vulnerability factors should be addressed in future research, including social, economic, and political factors. Community-based interventions to promote resilience and reduce vulnerability should also be studied. Effective policies and interventions can mitigate economic losses from floods, promoting sustainable development. The urgent need for policies and interventions to prevent flood-related morbidity and mortality is highlighted by this systematic review. Catastrophic floods can have significant health impacts, especially for vulnerable populations. Effective policies and interventions promote resilience to future extreme weather events. More research is needed to evaluate intervention effectiveness and identify factors contributing to flood vulnerability. Addressing flood health impacts requires a coordinated, multisector approach. Governments, civil society, and the private sector should work together.

EMERGENCY HEALTH PLANS AND STRATEGIES FOR FLOODING

Plans:

It is important to consider:

- Make sure that a temporary shelter can accommodate people with medical needs.
- Ensure that people with chronic illnesses have a list of their required medications easily accessible.
- Provide short and clear instructions on what to do in an emergency.
- Train first aid workers to work with vulnerable groups.
- Develop business continuity plans for primary healthcare.
- Provide not only medical services, but also preventive, promotive, and rehabilitative health services for flood victims.

- Incorporate the specific needs of different groups in programs for health sector surge capacity, emergency shelter, and quarantine.

Strategies:

- Government policies play a crucial role in improving the healthcare conditions of people during floods and managing the risk of disasters. This includes providing podiatric and mental health services. Proactive and collaborative humanitarian responses are essential to address health disparities and promote the well-being of displaced people.
- The government can reduce the negative impact of floods on the health sector by employing mitigation strategies such as subsidies, exemptions, and other revenue-based measures. This requires addressing the political and social variables involved in flood management.
- Ecosystems have an active influence on the climate and can be a critical expression of social resilience. Properly managing ecosystems based on biodiversity science can help humans adapt to rapid changes in the environment.
- Implementing flood risk management approaches can help control fragmentation. The participation, coordination, and engagement of both private and public entities, as well as the existence of sufficient formal regulations, can aid in flood risk management. It is crucial to strike a balance between legal certainty and adaptability in regulations.

REFERENCES

1. Adams, J., and Luchsinger, G. (2009). Climate change and drylands: beyond the

- drought. New York: UNDP Drylands Development Centre.
2. Ahmed, M. (2022). Floods Wreak Havoc Across Pakistan, Killing Over 900 People Since Mid-June and Leaving Thousands Without Homes.
 3. Ajani, A., and Van, D. G. K. (2021). Climate change in rural Pakistan: evidence and experiences from a people-centered perspective. *Sustain Sci*, 16, 1999-2011.
 4. Bandino, J. P., Hang, A., and Norton, S. A. (2015). Flood-related skin diseases: a literature review. *Dermatology Online Journal*, 21(5).
 5. Baqir, M., Ejaz, K., Masood, A., and Ahmad, N. (2012). Health impacts of floods in Pakistan. *Disaster Prevention and Management: An International Journal*, 21(4):504-516.
 6. BBC News. (2014). Alert in Multan as Pakistan flood river peaks. *Bbc.com*. 12 September 2014. Retrieved 24 February 2023.
 7. Bell, J. (2011). Climate change and human health: what are the research trends? A scoping review protocol. *Environmental Health*, 10(Suppl 1), S10.
 8. Caney, S. (2012). Just emissions. *Philosophy and Public Affairs*, 40(4):255-300.
 9. Chaudhry, P. (2017). Floods in Pakistan: A Historical Perspective. In P. Chaudhry (Ed.), *Flood Risk Management in Remote and Impoverished Areas*, Springer, 1-16.
 10. Crowther, T.W., Todd-Brown, K.E.O., Rowe, C.W., Carey, J.C., Machmuller, M.B., Snoek, B.L., Fang, S., Zhou, G., Allison, S.D., Blair, J.M., Bridgham, S.D., Burton, A.J., Carrilo, y., Reich, P.B., Clark, J.S., Classen, A.T., Dijkstra, F.a., Elberling, B., Emmett, B.A., Estiarte, M., Frey, S.D., Guo, J., and Harte J. (2016). Quantifying global soil carbon losses in response to warming. *Nature*, 540(7631):104-108.
 11. Daniel, M., Lantagne, D., and Parker, E. (2021). The impact of natural disasters on infectious diseases: a systematic review. *International Journal of Environmental Research and Public Health*, 18(4):1460.
 12. Dawn. (2012). Floods triggered by downpours wreak widespread devastation. *Dawn.Com*. 10 September 2012. Retrieved 20 December 2022.
 13. Fox, G., and Sheehan, M. C. (2019). The links between climate change, disasters, migration, and social resilience in Asia: A literature review. *International Journal of Environmental Research and Public Health*, 16(19):3573.
 14. Gardiner S.M. (2004). Ethics and global climate change. *Environmental Ethics*, 114(3):555-600.
 15. Geddes, L. (2022). Pakistan floods: how the humanitarian disaster unfolded. *New Scientist*. Retrieved from <https://www.newscientist.com/article/dn19428-pakistan-floods-how-the-humanitarian-disaster-unfolded/>
 16. Gishkori, Z. (2022). Deadly floods claim over 1,000 lives and affects 1/5th of Pakistan. *Samaa TV*.
 17. Global Register of Major Flood Events. (2007). Scroll Down and Look For Links to Maps In The Country Column. Retrieved 13 March 2023.
 18. Ilyas, F. (2022). Starving Flood Victims Face Infectious Diseases under Open Sky in Sindh. Retrieved from <https://www.dawn.com/news/1708410/starving-flood-victims-face-infectious-diseases-under-open-sky-in-sindh>.
 19. Islamic Relief Worldwide. (2009). Where We Work. *Islamic-relief.com*. 24

- October 2009. Retrieved 19 February 2023.
20. Khan, S. (2022). Floods and human health: a case study of Pakistan. *International Journal of Disaster Risk Reduction*, 62.
 21. Kirsch, T.D., Wadhvani, C., Sauer, L., Doocy, S., and Catlett, C. (2012). Impact of the 2010 Pakistan Floods on Rural and Urban Populations at six Months. *PLOSS Currents Disasters*, doi: 10.1371/4fdfb212d2432.
 22. Lockie, S. (2017). Responsibility and agency within alternative food networks: assembling the “citizen consumer”. *Agriculture and Human Values*, 34(1):67-81.
 23. Mahesar, A. (2022). Pakistan Today, Flood Induced Migration in Sindh. Retrieved from: <https://www.pakistantoday.com.pk/2022/09/27/flood-induced-migration-in-sindh/#:~:text=Flood%2Dinduced%20migration%20in%20Sindh>
 24. Monsoon. (2011). A backlash of the floods? History of Pakistan floods in Detail | Pakistan Weather Portal (PWP). Pakistan Weather Portal. 13 June 2011. Retrieved 19 February 2023.
 25. Paavola, J. (2017). Health impacts of climate change and health and social inequalities in the UK. *Environmental Health*, 16(1):113.
 26. Pakistan Flood. (2022). Pakistan Floods 2021. Retrieved from <https://www.pakistanflood.org/>.
 27. Pakistan Floods. (2010). The Deluge of Disaster-Facts and Figures as of 15 September 2010. Retrieved 20 March 2023.
 28. Peel, L., Finlayson, B., and McMahon, T. (2018). Updated world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences Discussions*, 4(2):439-473.
 29. Rehman, A. (2022). The impact of COVID-19 and floods on human health in Pakistan. *Journal of Public Health*, 30(1):23-28.
 30. Shafi, S., Khan, A., and Khan, M. (2022). Land Administration System in Pakistan: A Critical Review. *Land Administration and Management in Pakistan: Issues and Challenges*, Springer, 1-18.
 31. Shah, S. A., Khan, M. A., and Khan, M. A. (2020). Floods and health in Pakistan: a systematic review of the literature. *International Journal of Disaster Risk Reduction*, 51.
 32. Shreshta, M. S. (2008). Impact of Floods in South Asia, *Journal of South Asia Disaster Studies*, <http://saarc-sdmc.nic.in/pdf/publications/journal/chapter-6.pdf>.
 33. The Express Tribune, 2014. Heavy monsoon rains kill over 40 in Pakistan. *Tribune.com.pk*. 4 September 2014. Retrieved 27 February 2023.
 34. The Express Tribune. (2011). Floods worsen, 270 killed: officials. *The Express Tribune*. 13 September 2011. Retrieved 01 January 2023.
 35. United Nations Population Fund. (2022). Pregnant women and girls face heightened risks in wake of Pakistan floods. Retrieved from <https://www.unfpa.org/news/pregnant-women-and-girls-face-heightened-risks-wake-pakistan-floods>
 36. Winter, T., Kienberger, S., and Greiving, S. (2022). The impact of floods on health and well-being: a systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 19(1):113.
 37. Zaidi, S. (2010). Pakistan flood 2010: an opportunity to build back better.

International Workshop on Floods in
Pakistan. 280:167-178.