

Flooding and Health

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Abstract:

Global warming and rapid demographic transitions have drastically increased populations in flood-prone areas, escalating global disease burdens, hospitalizations, and mortality. Flooding triggers severe health crises, including water-borne, vector-borne, and respiratory diseases, disproportionately affecting vulnerable groups like the elderly and those with chronic comorbidities in low- and middle-income countries (LMICs). Despite challenges in implementing clinical prophylaxis like doxycycline for leptospirosis during real-world disasters, evidence shows that proper macro-management—such as early warning systems, infrastructure strengthening, and coordinated medical and sanitation planning—can successfully mitigate these impacts. Ultimately, flash floods present a systemic threat to healthcare facilities, akin to emerging infectious diseases. To withstand intensifying planetary and demographic pressures, the medical profession must strengthen cross-sectoral collaboration to enhance healthcare infrastructure resilience and protect vulnerable populations.

Keywords: climate change and health, disaster preparedness, flooding, flood-related diseases, leptospirosis

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Introduction

Satellite data and demographic statistics suggest that the population in flood-prone areas rose from 58 million to 86 million from 2000 to 2018¹. Rainfall statistics and elevation help explain riverine and coastal flooding. Higher sea levels due to global warming extend the areas and periods of flooding, whereas local, specific events such as heavy rainfall create flash floods.

Global disease burden is significantly attributable to flooding. Not only drowning and submerged injury, but also excess morbidity and mortality follow flooding. From a meta-analysis by Yang et al.², who compiled data from 747 communities in 8 countries, hospitalization risk in the population increased and persisted for 210 days following the flooding period. The same group of scientists³ also reported that the all-cause, cardiovascular, and respiratory mortality rates increased for up to 60 days.

Perspectives on flooding

Flooding causes substantial financial loss and death, especially among low socio-economic groups, extreme age groups, and those with chronic morbidities. Evidence, however, shows that proper macro-management can mitigate these problems. For example, in Bangladesh⁴, cyclone-related mortality was reduced 100-fold, from 500,000 deaths in 1970 to 4,234 in 2007. Defense technologies such as early warning, cyclone shelters, evacuation planning, coastal embankments, reforestation, increased awareness, and better communication were key factors in such success.

Flooding leads to many health problems, including water-borne and food-borne diseases, respiratory diseases, wounds, mental health problems, and vector-borne diseases⁵. Critical infrastructure (energy, transportation, communication, logistics, and even the rescue center and hospital itself) is often compromised by unexpected flash floods. Disasters can be prevented, or reduced in

scope, only by preparedness and the strengthening of infrastructure. Medical services and supplies must be part of the planning and include clean water supplies and sanitation measures for the affected areas, shelters, and those providing medical services, including mental health services.

Outbreaks of leptospirosis are known to follow flooding. Despite the well-cited evidence regarding the high efficacy of 200 mg of doxycycline in preventing leptospirosis among US soldiers training in Panama in 1982⁶, similar evidence on pre-flood and post-flood prophylaxis is lacking due to the weakness of the studies in low- and middle-income countries⁷. Unlike the military exercise, which was well equipped and organized, a real flooding situation, especially a serious one, may make it unfeasible to run a quality randomized controlled trial.

Amidst the current demographic changes, populations affected by flooding in low- and middle-income countries (LMICs) have higher proportions of elderly people, making them more vulnerable to disasters. Larger proportions than before are being hospitalized during flooding. Current flood-related mortality is therefore attributable not only to flooding but also to aging and age-related comorbidities.

Finally, many newly emerging infectious diseases, such as Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS)⁸, Coronavirus disease 2019 (COVID-19), and the Ebola virus, can compromise healthcare systems by infecting healthcare personnel. Likewise, flash floods can also hamper hospitals by disrupting public infrastructure and medical facilities, which in turn causes unnecessary deaths. Hospitals must therefore be well guarded against similar disasters to protect against these newly emerging infectious diseases.

We are in an era of rapid demographic transition, which increases the aged population, and planetary pressure exemplified by global warming and consequent flooding. Our medical profession must work more closely

with other sectors in order to maintain our own resilience and help society move forward.

Conclusion

Flooding poses a multifaceted and escalating threat to public health, driven by the twin pressures of global warming and rapid demographic transition. As flood-prone populations continue to grow—particularly in low- and middle-income countries—the burden of water-borne, vector-borne, and respiratory diseases, along with excess cardiovascular and all-cause mortality, is expected to intensify. Vulnerable groups, including the elderly and those with chronic comorbidities, bear a disproportionate share of this burden.

Evidence from Bangladesh demonstrates that macro-level interventions—such as early warning systems, cyclone shelters, coastal embankments, and coordinated communication strategies—can dramatically reduce flood-related mortality. However, gaps remain in clinical prophylaxis during real-world disasters; the effectiveness of doxycycline for leptospirosis prevention outside controlled military settings, for example, has yet to be firmly established in community-based trials.

Critically, flash floods threaten not only individuals but also the healthcare infrastructure itself, mirroring the systemic disruption caused by emerging infectious diseases such as COVID-19 and MERS. Hospitals and health systems must therefore build resilience against flooding with the same rigor applied to epidemic preparedness.

To meet these challenges, the medical profession must strengthen cross-sectoral collaboration—integrating public health, urban planning, sanitation, and climate science—to protect vulnerable populations and sustain healthcare delivery in this era of intensifying planetary and demographic pressures.

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