

Post-Rasuwa Flash Flood: The Potential Use of Artificial Intelligence in Infectious Disease Surveillance

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ABSTRACT

Nepal frequently experiences natural disasters, including floods. On 26 August 2026, the Rasuwa flash floods struck Nepal, resulting in hundreds of deaths, and leaving thousands of people missing. Infectious diseases represent an important public health concern in the aftermath of such disasters. Evidence on the use of artificial intelligence (AI) for post flash flood infectious disease risk assessment remains limited. Here, we discuss the potential integration of AI as a complementary decision-support tool to strengthen infectious disease risk assessment and early warning following Rasuwa flash flood disaster in Nepal.

Keywords: Artificial intelligence; Infectious diseases; Nepal; Rasuwa flash flood.

INTRODUCTION

Artificial Intelligence (AI) has increasingly been applied across various sectors including, healthcare, in recent years. AI-based approaches use historical and other available data to generate predictions, identify potential risks and inform response strategies.^{1,2} In 2025, Nepal updated its national infectious disease surveillance framework, comprising the hospital-based sentinel Early Warning, Alert and Response System (EWARS), and community-based surveillance; an event-based system supported by the Surveillance, Outbreak, Response, Management and Analysis System (SORMAS), which facilitates reporting from municipalities.³ Together, these systems support the reporting of priority diseases, timely detection, investigation of public health threats, and appropriate responses, contributing to Nepal's national and global health security.³ However, this revised EWARS-SORMAS framework surveillance does not appear to explicitly describe the use of AI. We, therefore, discuss the potential integration of AI as a complementary decision-support tool to strengthen infectious disease risk assessment and early warning capacity following the Rasuwa flash flood disaster in Nepal.

Post-Rasuwa Flash Flood and Challenges for Infectious Disease Surveillance

Nepal, situated in a subtropical region, experiences a wide range of infectious diseases annually, many of

which show increased transmission during the monsoon seasons. In recent years, the country has faced both emerging and re-emerging infectious diseases transmitted through water, vectors, and the air, including cholera, leptospirosis, dengue, Japanese encephalitis, and measles.^{4,5} The devastating Rasuwa flash floods that occurred on 26 August, 2026,⁶ during the monsoon season, could further increase the risk of infectious disease outbreaks, due to the disruption of water and sanitation systems, population displacement, and challenges associated with the management of human and animal remains. Nepal currently relies predominantly on EWARS-SORMAS framework surveillance system. However, this system is primarily designed for surveillance, reporting and outbreak response rather than for independently generating comprehensive predictive models for future outbreaks. Moreover, during major disasters, such as the Rasuwa flash floods, health facilities, communication networks, laboratory facilities, transportation systems, and routine reporting mechanisms may be disrupted, resulting in delays data gaps or reduced completeness of surveillance data.

AI- as a Complementary Decision-Support Tool

AI could potentially provide complementary analytical support by integrating multiple and heterogeneous data sources that capture different dimensions of infectious disease risk. Epidemiological data provide information on observed disease patterns, while

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climatic environmental, hydrological, population, animal health information, mobility, WASH-related data can provide important contextual information on factors that influence pathogens transmission. By analysing these data jointly, AI-based models may identify complex interactions, nonlinear relationships, and emerging spatial/temporal patterns that may not be readily apparent from routine surveillance alone. This could enable more comprehensive and timely assessment of changing infectious disease risks, particularly when routine surveillance data are incomplete or delayed following major disasters. AI-based tools could also facilitate the analysis of population-level risk factors to estimate and potentially forecast the risk of infectious disease outbreaks. Nepal could, therefore, consider a carefully monitored pilot integrating AI-assisted risk assessment with existing surveillance systems in the aftermath of the Rasuwa flash-flood disaster. An initial model could generate short-term, spatially explicit risk estimates for priority post-flood diseases and syndromes. Routinely available and near-real-time data could be incorporated, with AI generated predictions accompanied by uncertainty estimates and information on the principal factors contributing to increased risks. A phased evaluation would be essential, beginning with silent prospective validation, in which AI-generated predictions are assessed against subsequent epidemiological outcomes without directly triggering public health interventions. If predefined performance thresholds are met, the system could progress to supervised implementation, with AI-generated alerts reviewed and validated by epidemiologists and public-health authorities, before any action is taken. Evaluation should compare the AI-assisted approach with conventional surveillance using predefined measures, including lead time to detection, predictive performance, false-alert burden, geographic coverage, feasibility, and impact on public-health decision making. Conventional epidemiological models should also be retained as comparators to determine whether AI provides meaningful additional value rather than assuming such benefits a priori. This approach would allow Nepal to test AI pragmatically and safely, while generating evidence on whether it can provide earlier and more actionable information during periods when routine surveillance is disrupted. If the pilot demonstrates sufficient utility, the model could subsequently be considered for integration into the national infectious disease surveillance framework, supported by appropriate human oversight, robust data governance, periodic recalibration, and independent evaluation. Conversely, if the pilot demonstrates limited utility, it could help identify the data, infrastructural,

and methodological barriers that constraints the effective application of AI in disaster settings.

CONCLUSIONS

As climate change and environmental degradation increase the frequency and complexity of floods, landslides, glacial hazards, and other extreme events, health systems require surveillance approaches that remain informative when conventional reporting networks are disrupted. The recent devastating Rasuwa flash flood severely damaged critical infrastructure, including components of the local health care system. This disaster could, therefore, provide an important real-world setting to pilot and evaluate AI-assisted infectious disease risk assessment, particularly because AI-based predictive approaches are not currently incorporated into Nepal's existing surveillance framework. Nevertheless, an AI-assisted system should not be considered a substitute for established public-health surveillance, but rather as an additional means of assessing and anticipating infectious disease risks, when timely information is most needed. Evidence generated through such a pilot could provide an empirical basis for the responsible integration of AI into Nepal's surveillance architecture, and inform the development of adaptable frameworks for other low- and middle-income countries confronting increasingly complex floods, landslides, glacial, and climate-related disasters.

CONFLICT OF INTEREST

The authors declare no competing interest.

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