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Impact of earthquake-induced tsunamis on public health

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Tsunamis are caused by rapid sea floor displacement during earthquakes, landslides and large explosive eruptions in marine environment setting. Massive amounts of sea water in the form of devastating surface waves travelling hundreds of kilometers per hour have the potential to cause extensive damage to coastal infrastructures, considerable loss of life and injury and emergence of infectious diseases (ID).
This study involved an extensive and systematic literature review of 50 research publications related to public health impact of the three most devastating tsunamis of the last 12 years induced by great earthquakes, namely the 2004 Sumatra-Andaman earthquake (moment magnitude Mw 9.2), the 2009 Samoa earthquake (Mw 8.1) and the 2011 Tōhoku (Japan) earthquake (Mw 9.0) in the Indian, Western Pacific and South Pacific Oceans respectively. The inclusion criteria were literature type comprising journal articles and official reports, natural disaster type including tsunamis induced only by earthquakes, population type including humans, and outcome measure characterized by disease incidence increase.
The potential post-tsunami ID are classified into 11 groups including respiratory, pulmonary, wound-related, water-borne, skin, vector-borne, eye, fecal-oral, food-borne, fungal and mite-borne ID. Respiratory infections were detected after all the above mentioned tsunamis. Wound-related, skin and water-borne ID were observed after the 2004 and 2011 tsunamis, while vector-borne, fecal-oral and eye ID were observed only after the 2004 tsunami and pulmonary, food-borne and mite-borne ID were diagnosed only after the 2011 tsunami. Based on available age and genre data, it is concluded that the most vulnerable population groups are males, children (age $\leq$ 15 years) and adults (age $\geq$ 65 years). Tetanus and pneumonia are the deadliest post-tsunami ID. The detected risk factors include (1) lowest socioeconomic conditions, poorly constructed buildings and lack of prevention measures, (2) lack of awareness and prior warning resulting in little time for preparedness or evacuation, (3) severely injured tsunami survivors exposed to high pathogen densities in soil and water, (4) destruction of critical infrastructures including health care systems causing delayed management and treatment of severe cases, (5) aggravating post-tsunami weather conditions, (6) formation of extensive potential vector breeding sites due to flooding, (7) overcrowded conditions in evacuation shelters characterized by small places, inadequate air ventilation, poor hand hygiene and dysfunction of the public health system, (8) low vaccination coverage, (9) poor personal hygiene, (10) minimum precautions against food contamination and (11) dependency of young children and weaker physical strength and resilience of elders needing assistance with daily activities.
In conclusion, our study referred to potential ID following tsunamis induced after great earthquakes during the last 12 years. The establishment of strong disaster preparedness plans characterized by adequate environmental planning, resistant infrastructures and resilient health facilities is significant for the early detection, surveillance and control of emerging ID. Moreover, the establishment and the unceasing function of reliable early warning systems may help mitigate tsunami-related impact on public health.