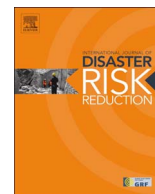




Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Integrated health education in disaster risk reduction: Lesson learned from disease outbreak following natural disasters in Indonesia

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ARTICLE INFO

Keywords:

Disaster risk reduction
Disaster education
Health education
Outbreak prevention
Post-disaster health issues

ABSTRACT

Along with large-scale loss of life, infrastructural damage, and material losses, health issues have become a crucially important problem after natural disasters. Survivors must confront the threat of health risks, especially infectious diseases, as a result of limited health supplies, services, and facilities. Limited knowledge about health risks following disasters, in addition to lack of awareness, contributes to the occurrence of infectious diseases that are fundamentally preventable. This study was conducted to review eight major natural disasters in Indonesia that were followed by outbreaks of infectious disease. Results emphasize the importance of integrated health education in schools and community-based disaster risk reduction (DRR) plans, including information dissemination, to create resilient communities. Water-borne and air-borne infectious diseases were the most common illnesses following the eight major natural disasters as a result of aftereffects. Facing the challenges, schools and community centers can be agents to disseminate health promotion information so that people become more aware of health risks and conduct good practices related to prevention, response, and recovery. Health education and promotion can be integrated into curriculum-based or training-based DRR programs as modules, short courses, drills, and printed and visual media.

1. Introduction

Dramatic disruptions such as terrorism, anthropogenic and natural disasters, and pandemics can create a crisis for countries and increase pressure on stakeholders that require prompt responses [1]. The crisis itself can increase people's vulnerability to numerous potential threats such as food, energy, and health security problems. Good practices in three cyclical stages are crucially important to address crises: prevention and preparedness, emergency response, and recovery and reconstruction [2]. Especially, those actions in every phase can reduce risks that occur after natural disasters. Some threats have been ameliorated by the humanitarian community, but investment in risk reduction after natural disasters remains limited [1].

Increased vulnerability after a crisis is specifically examined in this study. After natural disasters, people are threatened by potential health risks. They need well-prepared preventive measures and protection. Health has become a human security domains, as described in Human

Development Report 1994 [3]. Health resilience is strongly promoted throughout The Report of the UN High-Level Panel on Threats, Challenges and Change of 2004 because health problems including disease outbreak pose a threat to human security and to life chances [4]. Health is also prioritized in the Sendai Framework for Disaster Risk Reduction, which recommends integration of disaster risk management into each level of health care and national health systems [5]. Moreover, because the linkage between health and security is related to the emergence and re-emergence of infectious diseases, ending the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases, while combating hepatitis, water-borne diseases and other communicable diseases by 2030 has become a Sustainable Development Goal [6].

We studied some natural disasters in Indonesia to develop ideas on how to minimize health risks following natural disasters and to ensure good quality of life for people. For the past decade, Indonesia, a disaster-prone country, has been struck by natural disasters that have produced huge numbers of casualties, direct losses, and damaged

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<http://dx.doi.org/10.1016/j.ijdrr.2017.07.013>

Received 31 March 2017; Received in revised form 25 July 2017; Accepted 28 July 2017
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infrastructure. Two natural disasters have been widely devastating: an earthquake followed by tsunami in Aceh and North Sumatra Province in December 2004, also known as Indian Ocean Tsunami; and an earthquake in Yogyakarta and Central Java Province in May 2006. In addition to those two major natural disasters, natural disasters have occurred such as floods, earthquakes, tsunami, landslides and volcanic eruptions in the country. Each has created substantial effects on the affected areas.

Following such natural disasters, aside from the number of deaths and damaged infrastructure, the threat posed by health risks also looms, especially the emergence of infectious diseases. Some of following infectious diseases are likely to occur: diarrhea, acute respiratory infections (ARI) which may interfere normal breathing and caused by virus or bacteria, dengue, malaria, measles, and tetanus. Natural disasters also result in “aftereffects” such as displaced populations (including internally displaced persons (IDPs) and refugees), poor sanitation, overcrowded space, and limited health supplies in evacuation center that might increase the possibility of infectious disease outbreak and worsen conditions for survivors [7]. Aftereffects increase the transmission of infectious disease among survivors. The spread of a disease becomes more likely as the number of evacuated people increases. Aside from environmental changes and poor situations at evacuation centers, it is considered that people’s knowledge and awareness of health risks also becomes one factor determining the occurrence of the infectious diseases [8]. To tackle these and other challenges, collaboration for undertaking preventive measures of post-disaster infectious diseases should be integrated into disaster risk reduction (DRR) and management plans, and must be done not only by government, non-government organization (NGO) and non-profit organization (NPO), but also by public health and humanitarian professionals for the community [9].

Although results of our research on the tetanus outbreak that occurred after Aceh and Yogyakarta disasters suggest that health education is necessary to raise public awareness of the health risks that prevail after a natural disaster, the actual situation and gaps for health education and promotion must be investigated further [10]. Therefore, we conducted a systematic review of major natural disasters in Indonesia for 13 years (2004–2016), particularly addressing the emergence of infectious diseases after disasters. This study was conducted to elucidate recommendations for how preventive measures of infectious diseases can be accomplished through the dissemination of health education to the community as strategic targets by public health and humanitarian professionals. Accordingly, those recommendations are expected in the future to minimize health risks related to infectious diseases following natural disasters.

2. Material and methods

2.1. Comprehensive literature review

Original publications such as articles, reports and documents were screened during June 2016 – August 2016 using PubMed, Google Scholar, the World Health Organization (WHO) website, the government of Indonesia’s websites, textbooks about disaster management, and Sphere Project Handbook as available resources. Searches were conducted using several keywords, including ‘Indian Ocean Tsunami 2004’, ‘Yogyakarta Earthquake 2006’, ‘natural disasters’, ‘infectious diseases’, ‘outbreak’, ‘prevention’, ‘health education’, and ‘disaster risk reduction’.

2.2. Selection criteria

For documents published in 2004 or later, only those specifically including the keywords were examined further. Reports that included limited data, which were unrelated to disaster education, or which did not describe health risks posed by infectious diseases after a disaster

were excluded. The search revealed related publications, with the addition of ‘The Sphere Project’ Handbook, ‘Koenig and Schultz’s Disaster Medicine’, ‘Human Security and Natural Disasters (Routledge Humanitarian Studies)’, and ‘Disaster Management: International Lessons of Risk Reduction, Response, and Recovery’ textbooks. References were selected critically by identifying the contents and valid data related to disaster events, infectious diseases related to events, and disaster risk management in Indonesia.

2.3. Selection of DIBI data

Data presented herein were obtained from the “Data dan Informasi Bencana Indonesia” (Indonesia’s Disaster Data and Information, DIBI) by Badan Nasional Penanggulangan Bencana (Indonesian National Board for Disaster Management, BNPB) website in <http://dibi.bnpb.go.id/>. Data related to disasters were filtered using the times of the disasters (2004–2016), types of disaster (particularly addressing natural disasters), and the numbers of casualties and IDPs. Data related to the number of casualties, IDPs, and damaged infrastructure were used to determine the major disasters occurring within the past 13 years in Indonesia. We selected the disasters with >100 casualties and/or >1000 IDPs with information in WHO and selected publications related to infectious disease.

3. Findings

3.1. Major disasters in Indonesia (2004–2016) and infectious diseases following natural disasters

Screening of DIBI data and identification of infectious disease related information revealed that eight major natural disasters occurred during 2004–2016 in Indonesia [11]. The natural disasters mostly took place in Sumatra and Java islands (Fig. 1), producing death, injury, IDPs, and damaged infrastructure. Because Sumatra and Java islands are the most populous islands in Indonesia, the events threatened large populations and produced strong aftereffects. Those natural disasters were followed by the occurrence of infectious diseases.

3.1.1. Earthquake and tsunami in Aceh and North Sumatra Province

On December 26, 2004, a M 9.3 earthquake followed by tsunami, known as the Indian Ocean Tsunami of 2004, hit the northern island of Sumatra. This third-largest earthquake ever recorded produced its worst effects in Aceh and Sumatra provinces [12]. The total number of deaths reached almost 170,000, in addition to 6244 missing, and around half a million IDPs. Houses, public facilities, and other infrastructure were damaged severely [11]. Health risks posed by infectious disease included diarrhea, hepatitis A and E, ARI, measles, meningitis, malaria and dengue fever among affected people. An uncommon tetanus outbreak followed the disaster [7,10,12,13], with at least 100 cases. The outbreak is considered to have been caused by contaminated wounds that were prevalent at the time of the disaster or during its aftermath as a result of the survivors’ scavenging activities or searching for dead bodies around rubble and debris without wearing protection such as boots and gloves [14]. The fact that most of the confirmed cases occurred in males, because they had important roles in those activities (62%, with 22% dead), demonstrates that men also became vulnerable in the absence of appropriate prevention and protection.

3.1.2. Earthquakes in Aceh and North Sumatra Province

The Indian Ocean tsunami 2004 was followed by a second earthquake three months later. The M 8.6 earthquake occurred along the Island Nias in March 2005 [12]. Categorized as a large natural disaster, the event killed 915 people, with more than 100,000 people displaced, and more than 50,000 facilities left damaged (Table 1) [11]. Later, WHO reported at least 987 confirmed malaria cases and 15 dengue cases directly attributable to the Indian Ocean tsunami of 2004. These

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