Disaster Medicine and Public Health Preparedness

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Improvement of the Surveillance Protocols After Experiencing a Pseudo-Epidemic After 2018 Central Sulawesi Earthquake in Indonesia

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Brief Report

Cite this article: Pane M, Purnama TB, Sulasmi S, Rahman MA, Maemun S, Pandita H, Tenrisau MD and Sittimart M (2024). Improvement of the Surveillance Protocols After Experiencing a Pseudo-Epidemic After 2018 Central Sulawesi Earthquake in Indonesia. *Disaster Medicine and Public Health Preparedness*, **18**, e216, 1–3
https://doi.org/10.1017/dmp.2024.111

Received: 07 November 2023
Revised: 22 April 2024
Accepted: 24 April 2024

Keywords:
disaster; pseudo-epidemic; diarrhea; surveillance

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Abstract

Objective: Following a disaster, a pseudo-epidemic can occur due to redundant and duplicated data caused by infrastructure and information system disruptions. This study aims to investigate whether there have been improvements the post-disaster surveillance system in the comparison of diarrhea incidents between Central Sulawesi, Indonesia, and Cianjur, West Java, Indonesia.
Methods: We conducted an analysis of the epidemic-prone disease diarrhea before and during disasters, comparing the data with secondary data from the Early Warning Alert and Response System (EWARS) and the District Health Information System V.02 (DHIS-2).
Results: In central Sulawesi in 2018 and Cianjur in 2022, we observed an upsurge in diarrhea cases in the first week after the disaster. Although diarrhea cases increased after the disaster, they remained within acceptable outbreak criteria. Multiplication and redundant data were detected in the DHIS-2 system in Central Sulawesi, likely leading to erroneous overreporting. Changes in surveillance officers and their personal experiences during the disaster contributed to data inconsistencies. As compared to Central Sulawesi, the DHIS-2 reporting form in Cianjur was simplified as an individual form to enhance efficiency and accuracy.
Conclusions: Enhancing valid assessment and conducting thorough investigations are essential to improve surveillance protocols for epidemic-prone diseases following disasters.

On September 28, 2018, Central Sulawesi, Indonesia, was struck by a catastrophic 7.7-magnitude earthquake, accompanied by liquefaction, landslides, and tsunamis (EQ-2018-000156-IDN). This led to significant casualties and devastation across the districts of Palu, Sigi, and Donggala. Four years later, on November 21, 2022, Cianjur, West Java, Indonesia, experienced an earthquake of 5.6 magnitude and landslides (EQ-2022-000363-IDN), causing sector-wide impacts and disruptions.

A rapid health assessment post disaster reported that health disruptions occurred and affected many sectors.[1] There were outbreaks of infectious diseases, notably diarrhea, acute respiratory infections (ARI), and skin diseases, exacerbated by compromised water and sanitation systems.[2] Based on reports from Palu's provincial health officer in October 7, 2018, they highlighted several problems with contaminated drinking water and inadequate emergency sanitation facilities in affected shelters[1].

Pseudo-epidemics occur when the reported number of disease cases appears to be higher than the actual incidence. These can arise due to various reasons, such as heightened surveillance, changes in diagnostic criteria, or increased awareness and reporting of a particular disease. Pseudo-epidemics can lead to unnecessary public health interventions, diverting resources from other important health priorities. It is therefore important for public health officials to carefully evaluate reported data and consider the possibility of a pseudo-epidemic before taking any further actions.

The problems of data reporting and surveillance systems in disaster-affected areas are very complicated.[3] Several nongovernmental organizations and community organizations, as the government partners, usually deploy their medical teams to assist affected people. They regularly report to a designated disaster post, public health center, and district health office. Two weeks after the earthquakes, an analysis of data from the Provincial Districts Office following the disasters in Central Sulawesi and Cianjur revealed an exponential increase in reported diarrhea cases, largely attributed to double-counting and overreporting. The disaster in Central Sulawesi, accompanied by earthquakes, tsunamis, and liquefaction, had massive impacts on the

local health care system, whereas the disaster in Cianjur had only an earthquake, and the corresponding damage tended to be well controlled.

Nevertheless, an increase in the number of diarrhea cases was observed in both disaster conditions. Accordingly, the Centre of Health Crisis, Ministry of Health, Republic of Indonesia, in collaboration with the Indonesia Epidemiological Association, dispatched a team to enhance local health capacities and mitigate epidemic-prone diseases post disaster—in Central Sulawesi, Indonesia (2018), and Cianjur, West Java, Indonesia (2022). Surveillance evaluations from the disaster in Central Sulawesi were conducted and used to inform interventions implemented in the Cianjur setting. The study aims to investigate whether there have been improvements in the post-disaster surveillance system in the comparison of diarrhea incidents between Central Sulawesi, Indonesia, and Cianjur, West Java, Indonesia.

Methods

This study compared the case-reporting systems for diarrhea in two disaster settings: Central Sulawesi, Indonesia, in 2018 and Cianjur, West Java, Indonesia in 2022. The reporting system for epidemic-prone diseases, such as diarrhea, during the Central Sulawesi earthquake involved reporting the total number of cases through the Early Warning and Response System (EWARS) for weekly reports and the District Health Information System (DHIS-2) for daily reports. EWARS provides reports every Tuesday for the previous week's data, and DHIS-2 monitors and reports daily (at 3:00 p.m.) any post-disaster epidemic-prone diseases. During the disaster in Cianjur, the daily reports of epidemic-prone disease cases continued, albeit with a different format setting, wherein cases were reported individually rather than in aggregate form. Recounting for the data in Central Sulawesi conducted manually through aggregated data reported form, cleaning the duplication report and re-analysis for all the epidemic-prone diseases data in DHIS-2 platform. Furthermore, this study analyzed and compared diarrhea data from the disasters in Central Sulawesi and Cianjur, taking into account the parameters of timeliness and completeness within the surveillance system implemented in Central Sulawesi.

Results

In the Central Sulawesi setting, the data from EWARS provided an overview of diarrhea cases that occurred at different timepoints before and during the disaster (Figure 1). At weeks 40–43, there was a profound increase in diarrhea cases observed in Central Sulawesi. To follow up on these data, direct investigation in the field was conducted. Case-recording was not only carried out by routine health workers but also assisted by volunteers from various institutions when a disaster occurred. Furthermore, the recording cases were reported to several parties (channels). Notably, when summation of duplicated data was carried out, there was a very high spike in cases, even though the conditions on the ground did not show that. Most likely, there were repeated or duplicated recordings. This situation might be identified as erroneous overreporting if not thoroughly examined beforehand. The issue in Sigi was also influenced by the change in surveillance officers prior to the disaster, where the new officers had not yet grasped the surveillance conditions well before, during, and after the disaster. This was further exacerbated by surveillance officers and/or their families being affected by the disaster, thereby impeding the optimal functioning of surveillance monitoring. Recounting the data, there were several epidemic-prone diseases reported during the disaster. Up until week 38, which corresponded to the period before the disaster, there was no surge in diarrhea cases compared to before and during the disaster (0–14 days). Interestingly, although several diseases were observed to have fluctuation trends, the case ratio of diarrhea after the earthquake was consistently shown to be greater than that before the disasters in Palu, Sigi, and Donggala. An increase in diarrhea cases was reported during weeks 40–43, which was the period after the disaster. However, according to the criteria of outbreak, these ratios were considered under control, as they did not increase more than two times.

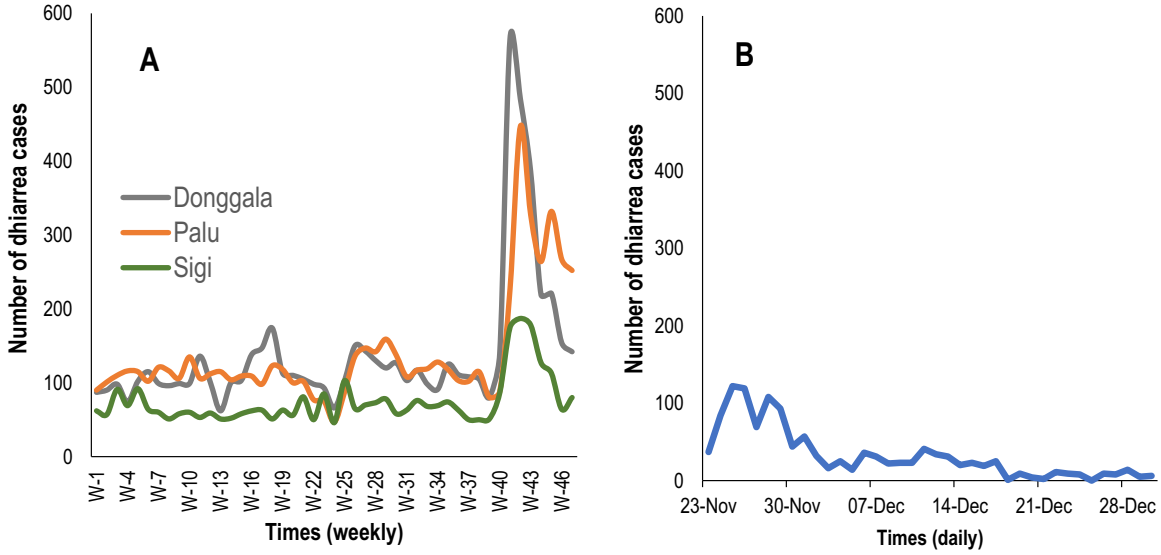

Figure 1. Diarrheal cases trend in the Central Sulawesi disaster (right side, Figure 1a) and the Cianjur disaster (left side, Figure 1b). Figure 1a presents the trend of weekly diarrheal cases in 3 districts in Central Sulawesi in epidemiological week 39 (2018). Figure 1b presents the trend of daily diarrheal cases in the Cianjur district, West Java Province, Indonesia, after the day of disaster (November 22, 2022).

https://doi.org/10.1017/dmp.2024.111 Published online by Cambridge University Press

The DHIS-2 reporting form in Cianjur has been modified to a simpler individual form, compared with the Central Sulawesi outbreak, which was reported rigidly and was time-consuming. This new form includes essential information such as demographic characteristics, shelter details, clinical diagnostics, and therapies provided. The reporting of cases is solely conducted by surveillance officers, focusing on 194 shelters in disaster-affected areas. To address the issue of incomplete daily surveillance reports due to human resource shortages, particularly among surveillance officers who were directly affected by the disaster along with their families, coordination was facilitated through a WhatsApp group. Approximately two weeks after the earthquake, a surge in epidemic-prone diseases was observed across 18 affected villages in Cianjur, starting on November 23, 2022. The increased diarrhea cases did not exceed two times the average of cases in the area, and most of the cases were females (51%) between 6 and 45 years old (58.1%). This increase can be overcome for a week with interventions to water and food sanitation in the shelter.

Discussion

Diarrhea, along with other diseases such as measles, yellow fever, dengue, is classified as an epidemic-prone disease. Diarrhea outbreaks occur regularly and contribute to high mortality rates worldwide.[4] Particularly, affected people are also vulnerable to infection with diarrhea.[5,6] In addition, disasters can pose a threat to the access of safe/clean water. Diarrheal disease outbreaks often occur when drinking water becomes contaminated, particularly in the aftermath of flooding and related displacement.[7] Following the December 2004 tsunami in Aceh Province, Indonesia (TS-2004-000147-IDN), a rapid health assessment was conducted two weeks later in the town of Calang, Aceh Jaya District, the Province of Aceh, Indonesia. It was revealed that all survivors had consumed water from unprotected wells, and 85% of residents were reported to have experienced diarrhea in the previous two weeks.[8]

As a result of double-reporting and misdiagnosed cases, this pseudo-epidemic occurred in the Central Sulawesi setting and was observed in weeks 40–43. According to investigation reports, there was a misdiagnosis of a patient who experienced liquid bowel movements fewer than three times per day. It was recognized that the chaotic atmosphere during the disaster contributed to erroneous data collection. To ensure data accuracy, verification processes are indeed essential. Because of the Central Sulawesi experience, follow-up efforts were undertaken in the Cianjur setting, such as contacting the data entry manager to correct the data, sharing the findings during daily meetings with health-related officers, and disseminating the findings through WhatsApp groups comprising provincial and district oversight officers. The change in reporting format from total case counts to individual cases reduced the occurrence of double-reporting errors. Following these efforts, the number of reported diarrheal incidents decreased, and the outbreak curve did not exhibit an epidemic pattern.

Controlling pseudo-epidemics requires a thorough understanding to identify and address the underlying factors that contribute to the apparent increase in the number of cases. Here are some steps that can be taken to control pseudo-epidemics: Public health officials should conduct a thorough investigation of the data to determine whether the observed increase in cases is reflective of a real increase in disease incidence or if other factors such as changes in diagnostic criteria or increased surveillance are contributing to the apparent increase. Officials should consider using more specific diagnostic tests to accurately identify cases and exclude individuals who do not actually have the disease. Healthcare providers should be educated on the appropriate diagnostic criteria for the disease in question and be encouraged to report cases only when they meet the established criteria. Surveillance systems should be improved to accurately capture and report cases of the disease. This may involve increasing the number of health care facilities reporting cases, using more sensitive diagnostic tests, or improving data collection and reporting systems. Public health officials should communicate with the public to provide accurate information about the disease and the measures being taken to control it. This can help prevent unnecessary panic and reduce the likelihood of overreporting of cases.

Conclusion

In the context of establishing a post-disaster surveillance system like DHIS-2, a key requirement involves prioritizing the collection of individual-level data over aggregated data. Future directions for such a system may include enhancing water and food security education, improving health and nutrition services, reinforcing critical infrastructure resilience, and ensuring the safeguarding and appropriate utilization of personal data.

Acknowledgments. The author would like to thank those who have contributed to this research; Chairperson of the Indonesian Epidemiological Association, Ministry of Health Rep of Indonesia, WHO Representative for Indonesia, Head of Provincial and Districts Health Office, all PAEI working teams in Palu City, Sigi and Donggala and Cianjur District.

Competing interest. The authors declare no competing interest is available on this study and compliance with ethical standard.

Author contribution. Masdalina Pane and Tri Bayu Purnama have an equal contribution.

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