JBE
Jurnal Berkala EPIDEMIOLOGI

JURNAL BERKALA EPIDEMIOLOGI
Volume 8 Issue 3 (2020) 208–217
DOI: 10.20473/jbe.v8i32020. 208–217
p-ISSN: 2301-7171 ; e-ISSN: 2541-092X
Website: http://journal.unair.ac.id/index.php/JBE/
Email: jbe@fkm.unair.ac.id / jbepid@gmail.com

ORIGINAL RESEARCH

POST TSUNAMI IMPACT ON HYPERTENSION AND DIABETES MELLITUS CASES IN PANDEGLANG DISTRICT, BANTEN, INDONESIA

Dampak Paska Tsunami pada Kasus Hipertensi dan Diabates Melitus di Kabupaten Pandeglang, Banten, Indonesia

Mugi Wahidin[1,2,3], Fiona Kong[4] , Hadi Safaat[5]
[1]National Institute of Health Research and Development, Ministry of Health, Indonesia
[2]University of Esa Unggul, Jakarta, Indonesia, wahids.wgn@gmail.com
[3]Indonesia Epidemiological Association, wahids.wgn@gmail.com
[4]City University of Hong Kong, Hong Kong, fymkong@cityu.edu.hk
[5]Provincial Health Office of Banten, Indonesia, hadisafaat@gmail.com
Correspondence Author: Mugi Wahidin, wahids.wgn@gmail.com, National Institute of Health Research and Development, Ministry of Health RI, Percetakan Negara St, Number 29, Jakarta Pusat, 10560, Indonesia

ARTICLE INFO

Article History:
Received June, 22nd, 2020
Revised form August, 20th, 2020
Accepted September, 12th, 2020
Published online September, 20th, 2020

Keywords:
diabetes mellitus;
hypertension;
non-communicable disease;
post disaster;
tsunami impact

Kata Kunci:
diabetes mellitus;
hipertensi;
penyakit tidak menular;
pasca bencana;
dampak tsunami

ABSTRACT

Background: Pandeglang, a district in Banten province, Indonesia, was the worst affected area of the Sunda Strait tsunami which occurred on 22nd December, 2018. Aside from threats of communicable disease outbreaks, the district faced the challenges of managing non-communicable diseases (NCD) in the community. **Purpose**: The aim of the study is to describe the post tsunami impact on cases of hypertension and diabetes mellitus and the expected one-year projections of these diseases in the district of Pandeglang, Banten. **Methods**: In January 2019, we collected primary data from Pandeglang District Health Office (DHO) and 15 Public Health Centres (PHCs) that were heavily affected by the tsunami. Surveillance officers were also interviewed for their subjective opinions on disease projections in both the DHO and PHCs. Aggregated data of cases presenting to the PHCs for assistance were analysed in relation to the post tsunami period. The diseases of interest included hypertension and diabetes mellitus**. Results**: Reported cases of hypertension and diabetes mellitus increased a few days after the tsunami. For hypertension, the cases spiked on the 5th and 8th days, but for diabetes mellitus the spike came much later. Average cases of hypertension and diabetes mellitus per PHC were 62 and 3, respectively. At district and PHC level, hypertension and diabetes mellitus were considered as minor contributing factors to the morbidity and mortality in the affected communities. The projection of these diseases was optimistic after the first month. **Conclusion**: It can be concluded that the volume of cases with hypertension and diabetes in the district of Pandeglang tended to be in the first few weeks post tsunami These diseases are projected to lessen in the second month after the disaster due to the recovery of local health services.

How to Cite: Wahidin, M., Kong, F., & Safaat, H. (2020). Post tsunami impact on hypertension and diabetes mellitus cases in Pandeglang District, Banten, Indonesia. *Jurnal Berkala Epidemiologi*, *8*(3), 208–217. https://dx.doi.org/10.20473/jbe.v8i32020. 208–217

ABSTRAK

Latar Belakang: *Pandeglang, sebuah kabupaten di Provinsi Banten, Indonesia merupakan daerah yang paling parah terdampak tsunami Selat Sunda yang terjadi pada 22 Desember 2018. Selain menjadi permasalahan dalam kejadian luar biasa penyakit menular, kabupaten Pandeglang juga mempunyai tantangan dalam pengelolaan penyakit tidak menualr (PTM) di masayarakat.* ***Tujuan:*** *Penelitian ini bertujuan untuk mendeskripsikan dampak pasca tsunami pada kasus hipertensi dan diabetes melitus dan proyeksi setahun penyakit tersebut di Kabupaten Pandeglang, Banten.* ***Metode:*** *pada Januari 2019, data primer dikumpulkan dari Dinas Kesehatan (Dinkes) Kabupaten Pandeglang dari 15 Pusat kesehatan masyarakat (Puskesmas) yang terdampak tsunami. Petugas surveilans juga diwawancara pendapat mereka tentang proyeksi penyakit baik di Dinkes maupun Puskesmas. Data agregat kasus yang mewakili Puskesmas dianalisis pada pada periode pasca tsunami. Penyakit yang dianalisis adalah hipertensi dan diabetes melitus.* ***Hasil:*** *Kasus hipertensi dan diabetes melitus yang dilaporkan meningkat pada beberapa hari setelah tsunami. Kasus hipertensi meningkat tertinggi pada hari ke5 dan hari ke-8. Peningkatan kasus diabetes melitus lebih lambat dibanding hipertensi. Rata-rata kasus hipertensi dan diabetes melitus per Puskesmas adalah 62 dan 3 kasus. Di tingkat kabupaten dan Puskesmas, hipertensi dan diabetes melitus berkontribusi kecil dalam kesakiatan dan kematian pada masyarakat terdampak. Proyeksi hypertensi dan diabetes mellitus lebih baik setelah bulan pertama.* ***Kesimpulan:*** *Peningkatan jumlah kasus hipertensi dan diabetes melitus cenderung cukup tinggi pada minggu pertama pasca tsunami. Proyeksi kedua penyakit tersebut menjadi baik pada bulan kedua setelah bencana karena pelayanan kesehatan setempat berfungsi kembali secara normal.*

INTRODUCTION

On 22nd December, 2018 around 2100 hours (local time), a tsunami occurred in the Sunda Strait, as a result of a massive landslide on Anak Krakatau, an active volcano. The tsunami affected two provinces, Banten and Lampung. The most heavily affected district in Banten was Pandeglang, which has four sub-districts, namely, Sumur, Panimbang, Labuan, and Carita. The tsunami impacted heavily on the 15 primary health centres. There were 282 casualties, 2,675 cases with traumatic injuries and 44 missing. More than 27,000 persons were internally displaced. No damage was reported in any of the hospitals or PHCs, but this disaster disrupted health services and even affected the key surveillance systems in Pandeglang (BPBD Pandeglang, 2019).

Previous evidence has highlighted the major gaps in evaluating or assessing the effectiveness of interventions for non-communicable diseases (NCDs) in humanitarian situations, especially in natural disasters. A systematic review study showed that disasters interrupt treatment management and overall care for people with NCDs, which results in an increased risk of exacerbation of the illness and death. The interruption may be caused by a range of factors, such as damaged transport routes, reduced health services, loss of electricity, and evacuations. People with cardiovascular diseases and diabetes have an increased risk of their illness worsening, and this can result in death. There is a need to

expand traditional disaster approaches by public health to incorporate NCDs, and, for example, include them in the design of disaster policies and plans with a multisectoral approach (Ryan et al., 2015).

A disaster situation causes disruptions to health services and possible damage to healthcare facilities, so primary intervention will be in managing the most urgent health priorities based on the community needs. These priorities may include trauma injuries and communicable diseases but few studies have focused on interventions or guidelines on how to manage those affected with non-communicable diseases (Perone et al., 2017; Ruby, Knight, Perel, Blanchet, & Roberts, 2015).

Non-communicable diseases, such as hypertension and diabetes mellitus, are the leading causes of disability and death in low and middle income countries and disaster-prone areas (Slama et al., 2017). The sample registration system in Indonesia in 2015 reported that 71% of deaths in the previous year had been caused by non-communicable diseases. Furthermore, a report concerning Indonesian basic health research in 2018 showed an increase in the prevalence of hypertension from 25% in 2013 to 34% in 2018. Of these hypertension patients, 45.60% did not take hypertension drugs or did so irregularly, and 9% of diabetes patients did not take insulin or anti-diabetes drugs regularly (Ministry of Health RI, 2018). Due to limited health resources and its disaster-prone geographical characteristics, Indonesia faces the serious problem of preventing, controlling, and managing NCDs when a natural disaster occurs. Thus, hypertension and diabetes mellitus may become serious diseases to control post disaster. In the case of the Sichuan earthquake, 77% of admitted patients were reported with at least one NCD, and hypertension (47%) and diabetes (24%) accounted for the majority of them (Chan, Man, & Lam, 2019).

Limited evidence and varying local contexts, with different needs for each disaster, create issues for the district health office and PHC staff. As mandated in the Law of the Republic of Indonesia Number 24 of 2007, concerning disaster management, they are responsible for the mitigation of the impact of a natural disaster and the development of contingencies plans. Based on that law, the Ministry of Health is responsible, in a limited capacity, for guiding the recovery of local health services as well as repairing and rebuilding damaged health facilities. Another issue is surge capacity, where adequate skilled manpower is required to avoid disruption to routine health capacities, which includes preventing and managing NCDs in the affected subpopulation (President of RI, 2007).

In this context, the role of post disaster surveillance is to monitor the health of the affected community and to inform contingency health planning, especially when health systems are overburdened and accessibility is limited. Ongoing and systematic surveillance of prevalent diseases and diseases of epidemic potential can provide information for assessing, planning and developing an effective and efficient plan for prevention and control. While the Ministry of Health has set up an Early Warning Alert and Response System (EWARS) for 23 communicable diseases of epidemic potential, for NCDs, the surveillance is done routinely every month via the PHC information system. There is no existing standardized protocol for the daily surveillance of NCDs. After the Central Sulawesi tsunami in 2018, a protocol was set up based on the emergency response declaration issued by the local government (Ministry of Health RI, 2019).

Hypertension and DM are major NCDs that can worsen post disaster, and the prevalence of these diseases means that this could be a considerable problem in disaster areas. Furthermore, continuous treatment of patients with hypertension and DM needs to be maintained even in a disaster zone to prevent disease complications. It is necessary to monitor and project these diseases post disaster to maintain a good health service (Chan, Man, & Lam, 2019).

Hypertension and DM were among the diseases that were reported daily post disaster in the Pandeglang district. Communicable diseases, injuries and mental health were also reported but no other NCDs were. There is a need to understand the problems learnt from the disaster area with respect to hypertension and DM. The aim of this study is to describe the impact of the tsunami on cases of hypertension and diabetes mellitus, and the expected one year projections of these diseases in the district of Pandeglang, Banten. We did not include communicable diseases, trauma injuries, mental health or other NCDs in our study.

METHODS

A mixed method approach was used to analyse the data. This study was based on the Indonesian Epidemiological Association (PAEI) Decree No 176A/PEI/XII/2018 about Immediate Disaster Assessment of Epidemic Prone Disease

Surveillance in Banten and Lampung Province. A descriptive analysis was performed of both hypertension and diabetes mellitus cases presenting to the PHCs from 23rd December 2018 to 10th January 2019. The daily cases presenting to the PHCs are presented in graphs.

We also used qualitative analysis for the projection of the diseases. The projection was based on an estimation from an in-depth interview with an informant, who predicted future diseases post-disaster, according to their local information, knowledge and experience. We used the expected one-year projection results of the two key NCDs from the deployed World Health Organisation's instrument, Public Health Situation Analysis, which was conducted in the month of January, 2019. The respondents were the PHC surveillance officers from the 15 affected PHCs, namely Sumur, Cigeulis, Cibaliung, Cimanggu, Panimbang, Perdana, Angsana, Pegelaran, Carita, Jiput, Labuan, Munjul, Pulosari, Cipeucang, and Sindangresmi, and the DHO of Pandeglang, Banten Province, Indonesia.

For the Public Health Situation Analysis, the data were categorised subjectively by the surveillance officers into five colour codes of red, orange, yellow and green while grey indicated morbidity and mortality. Each of the two NCDs were analysed separately at intervals of one month, two months, three to six months and six to twelve months post disaster. Changes in risk over time show the expected progression after an acute onset emergency, or predicable seasonality of morbidity of hypertension and DM. Red means that there will be far higher than usual morbidity and mortality related to the NCDs (hypertension and DM). Orange indicates that the diseases could cause considerable morbidity and mortality. Yellow means that the diseases will be a minor contributing factor to morbidity and mortality. Green refers to the perception that the disease is not a threat. When a plausible assessment cannot be made based on the data at that time, grey is indicated. These colours indicate the expected projection of risk over time based on the respondents' subjective experience. The respondents performed a current analysis of the magnitude (in terms of excess morbidity and mortality) of different health problems impacting the crisis-affected population, grouped into major disease types.

RESULTS

For both hypertension and diabetes mellitus, the increase in reported cases can be seen a few days after the tsunami. For hypertension, the reported cases spiked on 27 December 2018 (5th day) and 29 December 2018 (8th day) before decreasing gradually (Figure 1). For diabetes mellitus, there was a much later spike of cases presenting to the PHCs. They spiked on January 2nd (11st day) and 4 January (13rd day) before declining sharply (Figure 2).

The total cases of hypertension from all 15 PHCs was 1,157 which the largest number of cases was reported in the PHCs of Labuan and Panimbang. The number of cases of diabetes mellitus presenting at the PHCs fluctuated. In the PHCs of Carita and Panimbang, a sharp increase was seen on date (11th day) and date (13th day) respectively. There were 55 cases of diabetes mellitus in total in all 15 PHCs with the highest number in the PHC of Labuan (Table 1).

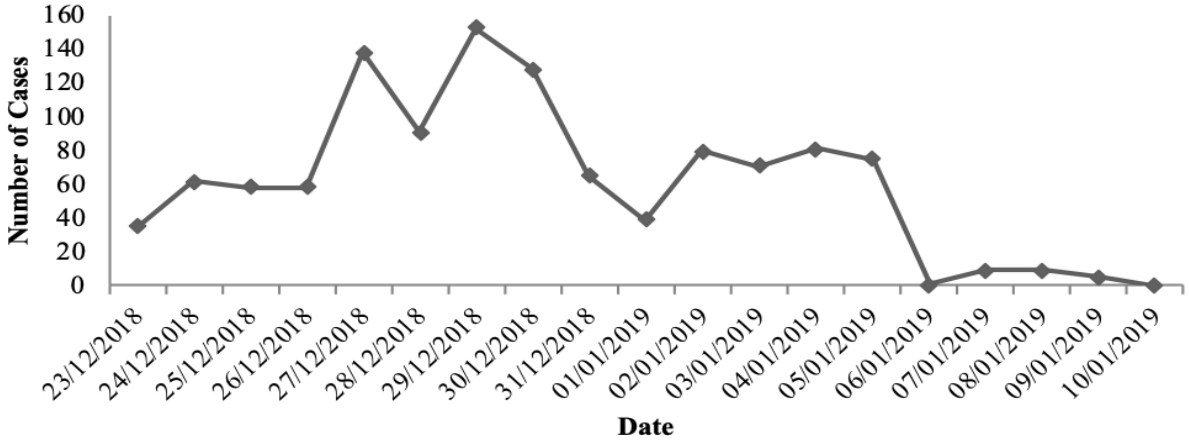

Figure 1. Aggregated Number of Reported Cases with Hypertension Presenting to 15 PHCs in Pandeglang from 23/12/2018 to 10/01/2019

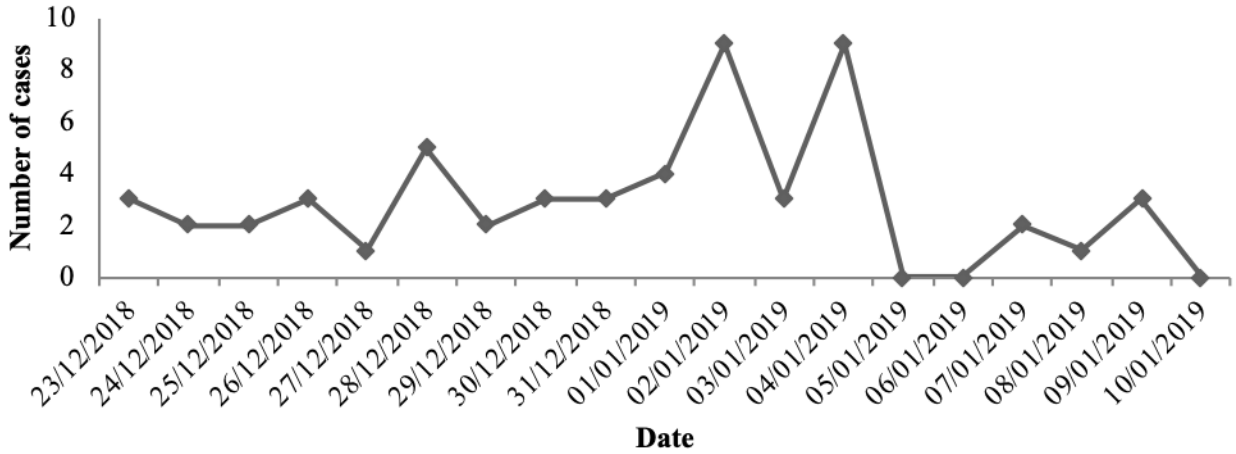

Figure 2. Aggregated Number of Reported Cases with Diabetes Mellitus Presenting to 15 PHCs in Pandeglang from 23/12/2018 to 10/01/2019

Table 1
Reported cases of Hypertension and Diabetes Mellitus in Pandeglang's PHCs from 23/12/2018 to 10/01/2019

PHC	Total Cases Hypertension	Total Cases Diabetes Mellitus
PHC Sumur	71	1
PHC Cigeulis	128	3
PHC Cibaliung	10	2
PHC Cimanggu	88	1
PHC Panimbang	178	11
PHC Perdana	138	0
PHC Angsana	49	0
PHC Pagelaran	26	0
PHC Carita	71	8
PHC Jiput	94	4
PHC Labuan	206	20
PHC Munjul	34	2
PHC Pulosari	35	3
PHC Cipeucang	29	0
PHC Sindang Resmi	0	0
Total	1,157	55

At district level, according to the overall projections from district health officer respondents, hypertension and diabetes mellitus were considered as minor contributing factors to the morbidity and mortality in the affected communities. The projection was optimistic after the first month (Table 2).

Based on interviews with PHC officers, the issues of hypertension and DM in the 15 affected PHCs were projected to become a minor problem or minor excess to morbidity/mortality (yellow) in 11 out of 15 PHCs for the first and second months post disaster. The PHCs of Panimbang and Pagelarang projected the problem would still be there up to one year after the disaster. However, there was a problem of hypertension in the PHC of Perdana, where there was a case of death (red). The projection was made by respondents subjectively based on their knowledge and experience (Table 3).

DISCUSSION

There is a relationship between the impact of a disaster on public health service infrastructure and increased health risks for people with non-communicable diseases (including hypertension). After a natural disaster, hypertension can increase and become uncontrolled due to limited access to health care, lack of medicine and the disruption of regular health services. Mitigation strategies need to be put into place for all phases of the disaster cycle impacting public health service infrastructure (Ryan et al., 2016), and hypertension

control should be one of the priorities after a disaster. All recorded patients, especially victims of the disaster, should be listed and given access to health services, including medication, as usual (Ministry of Health RI, 2019)

. The increase in cases of hypertension and diabetes mellitus post disaster in Pandeglang in the first week, with an average of 62 cases per PHC for hypertension and 3 cases per PHC for diabetes mellitus, indicates the need for patient adherence to medication as well as the availability of health services. This result is in line with the study among community-dwelling patients attending the hypertension section after Hurricane Katrina in the United States, where 46% of the patients had less than perfect medication adherence. Uncontrolled blood pressure was very common in those patients. In addition, 7% of patients reported not taking their blood pressure medications when they evacuated, 28% said they had run out of blood pressure medications, 16% reported difficulties getting prescriptions filled, and 28% reported a blood pressure medication change post disaster (Krousel-Wood et al., 2008).

In order to manage and control hypertension post disaster, other factors should also be considered. One such factor associated with hypertension among Internally Displaced Peoples (IDPs) in Palu was diet (high sodium, high fat, low fruit and vegetables). Therefore, PHCs should routinely carry out health promotion activities that incorporate lifestyle behaviours, especially for people with hypertension and other co-morbidities. For instance, nutritional education can help to reduce the consumption of unhealthy foods (Sagita, Budiman, & Nurjanah, 2019).

The mortality of patients with diabetes mellitus might increase post disaster due to uncontrolled blood glucose. This can become a problem in Indonesia because there is a relatively high incidence of diabetes in this country and it also has a high risk of natural disaster. Based on Basic Health Research in Indonesia, the prevalence of diabetes was 8.50% nationally in 2018 (Ministry of Health RI, 2018).

The main concern is that individuals with diabetes mellitus may experience a lack of services post disaster. During the disaster period, medication access and compliance, coupled with nutritional balance, are the keys to reducing the incidence of complications (renal dysfunction, which may lead to failure). Individuals with renal failure, which can be initiated by hyperglycaemia, then require far more complex procedures, such as dialysis. With such procedures, adequate equipment and the necessary drugs are difficult to access in such situations. Logistical issues and medical complications will most likely occur during that period and may increase mortality. A study in Japan showed that patients with diabetes, who were affected by Japan's triple disaster, experienced a deterioration in their glycaemic control following the disasters. The extent of this deterioration was mediated by socio-demographic factors, with rural residence and older age being protective against the effects of the disaster on glycaemic control (Leppold et al., 2016).

Hypertension and diabetes mellitus were a problem in the first month post disaster, but the situation improved in the second month and from then onwards. In the first month, efforts to control the disease needed strengthening, including access to health services for patients. One month after the disaster, health services tended to have recovered and health facilities were operational again (Lempert & Kopp, 2019). Another study in Japan showed that patients with type 2 diabetes, who were managed with periodical hospital visits, did not show a significant deterioration in HbA1c levels (Nishikawa et al., 2015). Hyperglycaemia plays a critical role in the pathogenesis of micro-vascular complications, such as diabetic retinopathy, incipient nephropathy, and neuropathy, while atherosclerosis contributes to the pathogenesis of macro-vascular complications. Diabetes mellitus and hypertension are frequently present together (Yamazaki, Hitomi, & Nishiyama, 2018).

Table 2
NCD Projection for One Year Post Disaster in the district of Pandeglang

Health problem	Month, from disaster			
	1	2	3-6	6-12
Hypertension				
DM				

Table 3.
NCD projection for One year Post Disaster in 15 PHCs of Pandeglang District

Location	Health Problem							
	Hypertension				Diabetes Mellitus			
	Month, from Disaster				Month, from Disaster			
	1	2	3-6	6-12	1	2	3-6	6-12
PHC Sumur								
PHC Cimanggu								
PHC Cibaliung								
PHC Cigeulis								
PHC Panimbang								
PHC Perdana								
PHC Angsana								
PHC Pagelaran								
PHC Labuan								
PHC Cipeucang								
PHC Pulosari								
PHC Carita								
PHC Sindangresmi								
PHC Munjul								
PHC Jiput								

There will be a far higher than usual morbidity and mortality related to hypertension and DM
The diseases (hypertension and DM) will be a minor contributing factor to morbidity and mortality
The diseases (hypertension and DM) are not a threat

Health providers should collaborate with the community to deal with hypertension and DM patients post disaster. Cadres may be involved in disaster management. Research in Sampang, East Java showed that cadres were able to conduct prevention and control efforts for disasters. It is necessary to increase awareness and knowledge in the community, as well as train cadres, in disaster response (Wibowo, 2017). Furthermore, every district, especially those that have a risk of disaster, should have a rapid response team, including an emergency medical team, to help victims in the immediate aftermath of a disaster (Ministry of Health RI, 2019).

There is a relationship between the onset of hypertension and hypertensive complications. During this long period, a series of changes occur in the cardiovascular system, including cerebral circulation. Changes such as vascular remodelling, inflammation, oxidative stress and dysfunction baroreflex contribute to the pathogenesis of stroke caused by hypertension (Yonata & Pratama, 2016).

Surveillance of NCDs, especially hypertension and DM, is the responsibility of health programmers. NCD surveillance post disaster must be included in daily surveillance due to the importance of detection and appropriate response. As stated in the Ministry of Health decree No. 75/2019, a disaster can be defined as any occurrence that threatens and disrupts life caused by nature or otherwise. It may lead to loss of life, environmental damage, material loss, or psychological problems. Surveillance post disaster using DHIS2 needs to be strengthened (Ministry of Health RI, 2019).

Besides strengthening surveillance, the preparedness of medical teams and communities living in disaster-prone areas should be in place. A study in a hospital in Bandung indicated that 85% of nurses have a moderate preparedness in facing a disaster. The moderate readiness of a nurse means that they are sufficiently prepared, especially in the event command system (Lestari & Priambodo, 2017). Pharmacists should also be included in disaster preparedness. The drawing up of standard operating procedures and the mapping of pharmacists in disaster-prone areas is vitally important (Faradilla, 2018).

In the emergency setting, there should be drugs and devices ready for treating hypertension and diabetes mellitus. The Interagency Emergency Health Kit (IEHK) provides a standard package of medicines and simple medical devices for aid agencies to use in emergencies in disasters (Tonelli, Wiebe, Nadler, Darzi, & Rasheed, 2016). Preparedness also focuses on the following: ensuring personal preparedness for those with chronic diseases; improving informatics and the

availability of health care records; increasing capacity through improved access to pharmaceuticals, durable medical goods, and medical records; establishing standardized treatment plans; developing first responder and health care professional training modules; and expanding special-needs shelter capacity, resources, and budget allocations (Horn & Kirsch, 2018).

Community preparedness, particularly of families with elderly members, should be prioritized. A study in Klaten showed that such families were well-prepared for disaster risk reduction after the Merapi eruption (Nurhidayati & Ratnawati, 2018). Furthermore, the monitoring of blood pressure and blood glucose should be done regularly, especially for victims of disaster. Monitoring can be conducted by trained health workers, or cadres (Wirawati & Prasetyorini, 2016).

The safety of patients with diabetes mellitus and hypertension is also an important issue to manage in a disaster. A systematic review study from 30 studies indicated that the patient safety practices of Emergency Medical Teams (EMTs) in disaster zones are weighted towards acute clinical care, particularly surgery, and the management of non-communicable diseases is under-represented. There is no consensus on disaster-zone-specific performance indicators. These deficiencies represent opportunities to improve patient safety in disaster zones (El-Khani et al., 2019).

Controlling hypertension post disaster can done with medication, but non-medication treatment, such as psychological consultations and relaxation sessions, can be conducted in disaster settings, too. A study in Magelang, Central Java showed that autogenic relaxation decreased headaches among hypertension patients in the disaster-prone area of the Merapi volcano. Health care providers can use this alternative therapy for hypertension (Priyo, Margono, & Hidayah, 2018).

Research Limitation

The non-communicable disease projection in this study was based on subjective estimation from in-depth interviews with informants who predicted future diseases post-disaster using their local information, knowledge, and experience. There was, thus, the potential for research bias. In future research, it is hoped that more objective methods of determining the risk of non-communicable diseases will be employed.

CONCLUSION

It can be concluded that the volume of cases with hypertension and diabetes in the district of Pandeglang tended to be high in the first week post tsunami. However, these diseases were projected to be better in the second month after the disaster due to the recovery of the local health services.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

AUTHOR CONTRIBUTION

MW conceptualized the study. MW and HS conducted data collection and analysis. FK provided input and editing of the manuscript. All the authors approved the final version of the manuscript.

ACKNOWLEDGMENTS

We would like to thank the Director of Indonesia Epidemiological Association (PAEI), the WHO Representative to Indonesia, the Head of Banten Provincial Health Office, the Head of Pandeglang Disrict Health Office, the Head of Primary Health Centres in Pandeglang and Dr. Masdalina Pane for their involvement with the study and their support towards its success.

REFERENCES

BPBD Pandeglang. (2019). *Laporan korban dan kerusakan tsunami tahun 2019*. Pandeglang.

Chan, E. Y. Y., Man, A. Y. T., & Lam, H. C. Y. (2019). Scientific evidence on natural disasters and health emergency and disaster risk management in Asian rural-based area. *British Medical Bulletin*, *129*, 91–105. https://doi.org/10.1093/bmb/ldz002

El-Khani, U., Ashrafian, H., Rasheed, S., Veen, H., Darwish, A., Nott, D., & Darzi, A. (2019). The patient safety practices of emergency medical teams in disaster zones: a systematic analysis. *BMJ Global Health*, *4*(6), 1–10. https://doi.org/10.1136/bmjgh-2019-001889

Faradilla, M. (2018). Role of pharmacist in disaster management. *Pharmaceutical Sciences and Research*, *5*(1), 14–18.

Horn, R. B., & Kirsch, T. D. (2018). Disaster response 2.0: noncommunicable disease

essential needs still unmet. *American Journal of Public Health*, *108*(S3), 202–203. https://doi.org/10.2105/AJPH.2018.304604

Krousel-Wood, M. A., Islam, T., Muntner, P., Stanley, E., Phillips, A., Webber, L. S., … Re, R. N. (2008). Medication adherence in older clinic patients with hypertension after Hurricane Katrina: implications for clinical practice and disaster management. *The American Journal of the Medical Sciences*, *336*(2), 99–104. https://doi.org/https://doi.org/10.1097/MAJ.0b013e318180f14f

Lempert, K. D., & Kopp, J. B. (2019). Renal failure patients in disasters. *Disaster Medicine and Public Health Preparedness*, *13*(4), 782–790. https://doi.org/10.1017/dmp.2018.142

Leppold, C., Tsubokura, M., Ozaki, A., Nomura, S., Shimada, Y., Morita, T., … Hill, S. (2016). Sociodemographic patterning of long-term diabetes mellitus control following Japan's 3.11 triple disaster: a retrospective cohort study. *BMJ Open*, *6*(7), 1–8. https://doi.org/10.1136/bmjopen-2016-011455

Lestari, D. A. S., & Priambodo, A. P. (2017). Kesiapan perawat gawat darurat rumah sakit umum daerah Kabupaten Bandung dalam menghadapi bencana. *Jurnal Keperawatan 'Aisyiyah*, *4*(2), 23–31. https://doi.org/10.1119/1.4789885

Ministry of Health RI. (2018). *Indonesia basic health research report 2018*. https://doi.org/10.1017/CBO9781107415324.004

Ministry of Health RI. (2019). *Minister of health RI's regulation number 75 of 2019 concerning management of health crisis*. https://doi.org/.1037//0033-2909.I26.1.78

Nishikawa, Y., Fukuda, Y., Tsubokura, M., Kato, S., Nomura, S., & Saito, Y. (2015). Managing type 2 diabetes mellitus through periodical hospital visits in the aftermath of the Great East Japan Earthquake Disaster: a retrospective case series. *PLoS ONE*, *10*(5), 1–11. https://doi.org/10.1371/journal.pone.0125632

Nurhidayati, I., & Ratnawati, E. (2018). Kesiapsiagaan keluarga dengan lanjut usia pada kejadian letusan merapi di Desa Belerante Kecamatan Kemalang. *Jurnal Keperawatan Dan Kesehatan Masyarakat Cendekia Utama*, *7*(1), 20–31. https://doi.org/10.31596/jcu.v0i0.210

Perone, A. S., Martinez, E., Du Mortier, S., Rossi, R., Pahud, M., Urbaniak, V., … Beran, D. (2017). Non-communicable diseases in humanitarian settings: ten essential questions. *Conflict and Health*, *11*(1), 1–11. https://doi.org/10.1186/s13031-017-0119-8

President of RI. (2007). *Law of the Republic of Indonesia Number 24 of 2007 concerning disaster management*. Jakarta: Government of the Republic of Indonesia.

Priyo, P., Margono, M., & Hidayah, N. (2018). Efektifitas relaksasi autogenik & akupresur menurunkan sakit kepala & tekanan darah pada lansia hipertensi. *Profesi (Profesional Islam): Media Publikasi Penelitian*, *15*(2), 34–44.

Ruby, A., Knight, A., Perel, P., Blanchet, K., & Roberts, B. (2015). The effectiveness of interventions for non-communicable diseases in humanitarian crises: a systematic review. *PLoS ONE*, *10*(9), 1–16. https://doi.org/10.1371/journal.pone.0138303

Ryan, B., Franklin, R. C., Burkle Jr, F. M., Aitken, P., Smith, E., Watt, K., & Leggat, P. (2015). Identifying and describing the impact of cyclone, storm and flood related disasters on treatment management, care and exacerbations of non-communicable diseases and the implications for public health. *PLoS Currents*, *7*, 1–32. https://doi.org/10.1371/currents.dis.62e9286d152de04799644dcca47d9288

Ryan, B. J., Franklin, R. C., Burkle Jr, F. M., Aitken, P., Smith, E., Watt, K., & Leggat, P. (2016). Reducing disaster exacerbated non-communicable diseases through public health infrastructure resilience: perspectives of Australian disaster service providers. *PLoS Currents*, *8*, 1–38. https://doi.org/10.1371/currents.dis.d142f36b6f5eeca806d95266b20fed1f

Sagita, S., Budiman, B., & Nurjanah, N. (2019). Faktor-faktor yang berhubungan dengan penyakit hipertensi di pengungsian wilayah kerja Puskesmas Kamonji. *Jurnal Kolaboratif Sains*, *1*(1), 204–2016.

Slama, S., Kim, H.-J., Roglic, G., Boulle, P., Hering, H., Varghese, C., … Tonelli, M. (2017). Care of non-communicable diseases in emergencies. *The Lancet*, *389*(10066), 326–330. https://doi.org/10.1016/S0140-6736(16)31404-0

Tonelli, M., Wiebe, N., Nadler, B., Darzi, A., & Rasheed, S. (2016). Modifying the interagency emergency health kit to include

treatment for non-communicable diseases in natural disasters and complex emergencies. *BMJ Global Health*, *1*(3), 1–11. https://doi.org/10.1136/bmjgh-2016-000128

Wibowo, N. A. (2017). Peran Postaga dalam pemberdayaan kesiapsiagaan masyarakat Dalpenang Sampang Muhammadiyah wilayah Jawa Timur. *Aksiologiya : Jurnal Pengabdian Kepada Masyarakat*, *1*(2), 119–125.

Wirawati, M. K., & Prasetyorini, H. (2016). Cadre skill improvement efforts in the measurement of blood pressure. *Jurnal Ilmu Dan Teknologi Kesehatan*, *7*(2), 27–30.

Yamazaki, D., Hitomi, H., & Nishiyama, A. (2018). Hypertension with diabetes mellitus complications. *Hypertension Research*, *41*(3), 147–156. https://doi.org/10.1038/s41440-017-0008-y

Yonata, A., & Pratama, A. S. P. (2016). Hipertensi sebagai faktor pencetus terjadinya stroke. *Majority*, *5*(3), 17–21.