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Preparedness of coastal communities in facing a tsunami disaster

Preparación de las comunidades costeras para afrontar un desastre por tsunami

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SUMMARY

Introduction: *Disaster education for coastal communities has not been implemented well. Community disaster preparedness supports successful disaster management. This study aimed to assess if there is a link between disaster education and coastal community readiness for a tsunami disaster.* **Method:** *The research design is a correlational study using a cross-sectional approach. The sample obtained was 104 respondents using a simple random sampling technique. Analysis was performed using the Chi-Square test.* **Results:** *There was a relationship between disaster education and the preparedness of coastal communities in dealing with a tsunami disaster in Puger Kulon Village, Jember Regency; with a p-value< 0.0001 < 0.05, thus H1 is accepted, which means there is a relationship between disaster education and the preparedness of coastal communities in facing the tsunami disaster.* **Conclusion:** *The recommendation is that the quality of disaster education must be further improved so that the public can better understand and manage information to improve community preparedness in dealing with a tsunami disaster.*

Keywords: *Disaster education, disaster preparedness, tsunami.*

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RESUMEN

Introducción: *La educación acerca desastres para las comunidades costeras no se ha implementado bien. La preparación comunitaria para desastres apoya la gestión exitosa de desastres. El propósito de este estudio fue evaluar si existe un vínculo entre la educación sobre desastres y la preparación de la comunidad costera ante un desastre de tsunami.* **Método:** *Se uso un diseño de estudio correlacional utilizando un enfoque transversal. La muestra fue de 104 encuestados mediante una técnica de muestreo aleatorio simple. El análisis se realizó con la prueba de Chi-Cuadrado.* **Resultado:** *Hubo una relación entre la educación sobre desastres y la preparación de las comunidades costeras para hacer frente a un desastre de tsunami en Puger Kulon Village, Jember Regency, con un valor de p<0,0001 < 0,05, por lo que se acepta H1, lo que significa que hay una relación entre la educación sobre desastres y la preparación de las comunidades costeras para enfrentar el desastre del tsunami.* **Conclusión:** *La recomendación de es que se debe mejorar aún más la calidad de la educación sobre desastres para que el público pueda comprender*

y gestionar mejor la información a fin de mejorar la preparación de la comunidad para hacer frente al desastre del tsunami.

Palabras clave*: Educación sobre desastres, preparación para desastres, tsunami.*

INTRODUCTION

Natural disasters cause immense loss of human lives. Between 1996 and 2015, 1.35 million people have been killed by 7 000 natural disasters worldwide, of which 56 % are victims of earthquakes and tsunamis (1). Indonesia is a disaster-prone country. Quoting data from the American National Agency for International Strategy for Disaster Risk Reduction (UNISDR), geographically, Indonesia is an archipelagic country located at the meeting point of four tectonic plates, namely the Asian continent plates, the Australian continent, the Indian Ocean plate, and the Pacific Ocean: known as Ring of fire. There is a volcanic belt (volcanic arc) in Indonesia's southern and eastern parts. Stretching from the islands of Sumatra-Java-Nusa Tenggara-Sulawesi, the sides are old volcanoes and lowlands. This condition has a high potential and is prone to disasters such as volcanic eruptions, earthquakes, tsunamis, floods, and landslides. Indonesia ranks 36th in the country with a high Disaster Risk Index of 10.36 %. Efforts can be made to reduce disaster risks by developing knowledge and skills and raising awareness of the threat of disasters through disaster education. Jember Regency is a district with a diverse topography in coastal, lowland, and highland areas. Highland areas have relatively unstable mountainous contours and are prone to disasters, especially floods, and landslides (1,2).

Disaster education needs to be done to minimize the impact of disaster risks. Disaster education covers various important aspects related to disaster preparedness, such as recognition of potential disasters in the environment, history of disasters that have occurred, forms of disaster anticipation/mitigation, the impact of disaster on individuals and groups, forms of handling when a disaster occurs, and how to save oneself from a disaster occurred (3). Efforts to reduce disaster risk through disaster education for the community, especially in coastal areas, are still very minimal. This means that knowledge, skills, and awareness of the threat of tsunamis in coastal communities are still problems that must be resolved (4). Community preparedness in responding to disasters is evaluated in that Indonesian society is still relatively less reactive and responsive in facing natural disasters, which cannot predict when and where a disaster will occur, so community preparedness regarding a tsunami disaster is a problem that must be faced (5). Preliminary studies revealed that many people still underestimate the tsunami disaster, which is the highest potential disaster in the place where they live. There is minimal community participation in educational activities carried out by BPBD, and many people still misperceive the tsunami disaster. Disaster Emergency Preparedness and Handling Capacity in Indonesia reaches 35 %. The preparedness of the people of East Java Province is in the low category at 25 %. The preparedness of the Jember community has reached 25 %, plus Puger District is ranked first in areas with high tsunami potential (4). Coastal community preparedness can be influenced by knowledge and behavior, socioeconomics, socio-psychology, and structural and normative influences (6).

Based on the description that has been provided, disaster education is considered capable of increasing community preparedness in facing disasters. As stated before, this disaster education is expected to provide valuable insight into community perspectives regarding disaster risk and its impacts and preparedness measures and contribute to the development of effective strategies for disaster management (6,7). Another important disaster education is estimating a disaster's arrival time (EAT or ETA = Estimated Times of Arrival). This is important to increase preparedness for disasters (8). Thus, further research is needed regarding the relationship between disaster education and community preparedness for the tsunami.

METHODS

The research design was carried out using a correlational study using a cross-sectional approach to determine the relationship between

disaster education and the preparedness of young adults on the coast to face a tsunami disaster. This study measures the independent and dependent variables simultaneously, with no follow-up. The research was conducted in the coastal area of Puger Kulon Village, Jember Regency, which has a population of 141 people. From the population, a research sample was determined to represent the population in providing answers using a simple random sampling technique of 104 respondents. Data were analyzed using univariate analysis carried out on each variable from the results and bivariate analysis to determine whether there was a relationship between disaster education and the preparedness of coastal communities to face tsunami disasters. Bivariate analysis was carried out using the Chi-Square test.

RESULTS

The research results describe the relationship between disaster education and the preparedness of coastal communities to face tsunami disasters in Puger Kulon Village, Jember Regency. Data was collected from 104 respondents over 14 days, from 16-30 May 2022. The data includes the respondent community's characteristics, disaster education, and preparedness.

Respondents in this study were characterized based on age, gender, ethnicity, religion, and the highest level of education and occupation. The data in Table 1 show that most respondents in this study were aged 20 - 40, as much as 58.7 %; there were more women (51 %) than men; the majority are Javanese (60.6 %); the most education was high school (63.3 %); and the most common job is as a fisherman (42.3 %).

Table 1

General characteristics of respondents (n=104)

Characteristics	Frequency	Percent (%)
Age		
20 – 40 years	61	58.7
41 – 60 years	43	41.3
Gender		
Man	51	49.0
Woman	53	51.0
Etnics		
Jawa	63	60.6
Mature	41	39.4
Education		
Elementary school	11	10.6
Yunior High School	22	21.2
SMA	71	68.3
Employment		
Self-employed	30	28.8
Fisherman	43	41,3
IRT	31	29,8

Table 2. Distribution of respondents based on attendance at disaster education (n=104)

Attendance	Frequency	Percent (%)
Not Present	37	35.6
Present	67	64.4
Total	104	100.0

Table 2 shows that most respondents attended disaster education activities

Table 3. Distribution of respondents based on attendance at disaster education (n=104)

Level Preparedness	Frequency	Percent (%)
Very ready	29	27.9
Ready	33	31.7
Almost ready	21	20.2
Not ready	18	17.3
Not ready yet	3	2.9
Total	104	100.0

Table 3 shows that the respondents' preparedness in facing the tsunami disaster was the lowest in the not ready category (2.9 %) and the highest in the ready category (31.7 %).

Table 4. Analysis of the relationship between disaster education and respondents' preparedness in facing the tsunami disaster

	Chi-Square Tests		
	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-Square	79.027	4	0.0001
Likelihood Ratio	95.657	4	0.0001
Linear-by-Linear Association	64.878	1	0.0001
N of Valid Cases	104		

Table 4 shows Chi-Square test results, with a p-value of 0.0001. Thus, the H1 Hypothesis is accepted, meaning that there is a relationship between disaster education and the preparedness of coastal communities for a tsunami disaster in Puger Kulon Village, Jember Regency.

DISCUSSION

Disasters occur that are not expected by everyone and often happen beyond human control (15). Disasters are divided into two, namely natural disasters and human-caused disasters. Natural disasters include earthquakes, volcanic eruptions, floods and/or tsunamis, landslides and forest fires (9). All regions worldwide are experiencing the same fate, namely being hit by disasters. However, the types and degrees of disasters vary. The impacts of disasters differ depending on the community's type, degree and preparedness (10). The impact of disasters can be vast and cover many sectors such as infrastructure, economy, livelihoods, society, and others (8). Disaster management is generally divided into before, during, and after a disaster. Before a disaster occurs, disaster education is a very important variable in disaster management (11).

Our results show that most coastal communities in Puger Kulon Village attended disaster education activities, with 67 respondents (64.4 %).

Conceptually, disaster education aims to change a person's behavior, including increasing aspects of knowledge, understanding, changes in attitudes and actions, as well as awareness of disaster prevention (12). Mujiburrahman et al. agree with that, and revealed that disaster education is one of the pre-disaster activities to increase knowledge, awareness, and attitudes of the community to reduce losses that arise during a disaster (13).

Increasing a person's knowledge is expected to be able to change his behavior. This is to Lawrence W. Green's theory, which states that three factors can influence and follow up on it by changing, maintaining, or improving behavior in a better direction, namely predisposing factors, enabling factors and reinforcing factors (6,14) therefore, an essential step toward mitigating their current and future risks. This study provides a systematic review of coastal community resilience frameworks for disaster risk management, covering their content, structure, and assessment. Sixty-four critical resilience criteria under four dimensions are identified by analyzing the convergence and divergence of the consideration of assessment indicators in the reviewed frameworks. Existing frameworks focus mostly on 'governance and institutions', 'infrastructure', and 'society and the economy'. Despite significant risks, the impacts on the environment and potential risks of climate change are not prioritized. Only 22 % of the frameworks consider future risks, rendering the remainder inadequate for assessing projected risks from climate change. None of the frameworks consulted the full spectrum of stakeholders (public, government, and experts). In this case, disaster education, as part of the predisposing factors, must be of good quality to increase public knowledge about efforts to deal with tsunami disasters. *Disaster education* is one of the important activities to reduce the number of losses in a tsunami, a potential disaster in Puger Kulon Village. In general, the disaster education carried out by BPBD Jember Regency has not been optimal. This was shown by most respondents stating they were present (64.4 %) and respondents stating they were not present (35.6 %). These conditions indicate that the disaster education carried out by BPBD Jember Regency has not yet received its maximum benefits from coastal communities in Puger Kulon Village (4) .

The evidence indicates that educational or counseling activities need to be provided with

special methods so that people want to understand and apply what has been given by the instructors, namely by providing poster leaflets that can be posted on the doors of each house so that when the extension is forgotten, then they can still remember the material by looking at the poster. There are still many people who do not attend the tsunami disaster education activities carried out by BPBD Jember Regency due to several reasons, namely that they are busy with their work, so they cannot take part in disaster education activities, the public's perception of the disaster education being carried out seems monotonous and less interesting. The perception is that the tsunami is an unproven issue. Of course, this must be an evaluation for education implementers, namely BPBD Jember Regency (10).

Coastal Community Preparedness in Facing Tsunami Disasters in Puger Kulon Village Kabupaten Jember

The results show that coastal community preparedness is divided into five categories: 27.9 % in the very ready category, 31.7 % in the ready category, 20.2 % in the almost ready category, 17.3 % in the less ready category, and 2.9 % in the not ready category. The results listed by coastal communities in Puger Kulon Village, Jember Regency, are classified as communities with preparedness in the ready category.

Disaster preparedness is an activity that aims to ensure that the necessary resources can respond and take effective action during a disaster to minimize disaster risk through effective, timely and efficient action (7). There is a theory that explains several factors that can influence community preparedness, namely knowledge and behavior, socioeconomics, socio-psychology, and structural and normative influences (1,5), as preparation related to meeting food needs (10).

Preparedness of coastal communities is very important in facing a tsunami, the most significant potential disaster in the area. Therefore, disaster education has an important role in changing and strengthening community preparedness behavioral factors, including predisposing factors consisting of education, knowledge, attitudes and perceptions. Supporting factors (enabling factors) consisting of disaster training and education, as well as the availability and affordability of Kulon facilities and infrastructure, namely the existence of an Early Warning System (EWS) located on Pancer Beach, evacuation routes installed along the southern highway, banners and billboards installed at several points along the coast and evacuation places situated on the sand dunes, and reinforcing factors consisting of management commitment, the role of community leaders, the role of health workers, and the role of disaster management officers (15).

The roles of community leaders, health workers, and disaster management officers are well-known in efforts to reduce the risk of a tsunami disaster (16). This is known from the activities carried out by health workers related to disaster mitigation, such as outreach about first aid to members of the Puger Kulon Village organization and disaster education carried out by the village government for fishermen groups to maximize community preparedness for a tsunami disaster.

The Relationship between Disaster Education and the Preparedness of Coastal Communities in Facing Tsunami Disasters in Puger Kulon Village Kabupaten Jember

It was found that 64.4 % attended disaster education activities, and 35 % did not attend disaster education activities. Statistical tests using Chi-Square show an asymptotic significant value (2-sided) of 0.001; thus it can be concluded that H1 is accepted; there is a significant relationship between disaster education and the preparedness of coastal communities facing a tsunami disaster in Puger Kulon Village, Jember Regency (17) nurses must be adequately prepared to respond effectively to disasters. Therefore, it is necessary to assess nurses' disaster management capacity to know their preparedness levels, especially for a densely populated Megapolis like Dhaka, which is at high risk of disasters. Thus, the study aimed to examine Dhaka city nurses' knowledge, skills, preparedness (KSP). This can also be interpreted that the more optimal disaster education is, the better the level of preparedness of coastal communities in facing tsunami disasters (18).

It is very important to continue to carry out and improve disaster education quality because disaster education has a big impact on the preparedness behavior of coastal communities when facing a tsunami, the most significant potential disaster in the area (19). Not only is disaster education a predisposing factor for preparedness behavior that needs to be improved in quality, but the synergy of community leaders, health workers, disaster resilient village organizations, as well as the availability of facilities and infrastructure that can support increasing community preparedness and the ease of the community in reaching and accessing the availability of facilities and infrastructure are also important (20). In managing disaster preparedness, a transdisciplinary approach is hoped to be used for affected communities (21). Another thing that needs to be educated for the public to prevent disasters is integrating components into the environment (22). Our advice regarding disaster preparedness is that it is very important to develop disaster mitigation education in every region, including in Indonesian schools, as also written in the article (23). The government's role is also vital in disaster preparedness. The government needs to communicate effectively with the community so that people can understand disaster risks and how to prepare themselves. The government can carry out outreach through social media, brochures, posters, or public events that educate the public about disaster risks and how to overcome them[&](24).

CONCLUSION

It can be concluded that there is a relationship between disaster education and the preparedness of coastal communities in facing a tsunami disaster in Puger Kulon Village, Jember Regency, where the disaster education of coastal communities in Puger Kulon Village, Jember Regency is in the good category at 64.4 % and the preparedness of coastal communities in facing the tsunami disaster in Puger Kulon Village, Jember Regency in the ready category with 31.7 %.

RECOMMENDATIONS

The research results give several suggestions to the community, health services (Puskesmas), and the Regional Disaster Management Agency. The community is expected to increase awareness of the importance of preparedness for minimize the risk of tsunami disasters, which are the highest potential disasters in the area. Apart from that, health institutions, especially community health centers, can be more sensitive to preparedness issues by determining policies to improve health programs in the form of disaster risk prevention and reduction, especially those related to the tsunami disaster, and health promotion related to disaster mitigation in the community needs to be further improved to overcome community preparedness problems. Finally, suggestions for regional disaster management agencies can further enhance the quality of disaster education in the community to motivate people to participate in disaster preparedness efforts.

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