

Community Preparedness for Addressing Health Issues Following Tidal Floods: A Case Study of Sirenja Village, Donggala Regency

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ABSTRACT

Indonesia is among the countries most affected by disaster-related mortality. Disasters in Indonesia are caused not only by its geographical characteristics but also by climate change. Tidal floods represent one of the climate-related hazards resulting from sea-level rise and land subsidence. In Central Sulawesi, particularly Donggala Regency, tidal flooding frequently affects coastal communities and may lead to various health problems. This study aims to describe the level of community preparedness and health problems experienced following tidal floods in Sirenja Village, Donggala Regency. A quantitative descriptive approach was applied using questionnaire-based data collection involving 111 respondents. Community preparedness was assessed through four parameters: knowledge and attitudes, emergency response planning, early warning systems, and resource mobilization. The findings indicate that community preparedness was predominantly classified as moderate, accounting for 83 respondents (74.8%). Regarding post-flood health outcomes, 63 respondents (56.8%) reported no health issues, while 35 respondents (31.5%) experienced diarrhea following tidal flood events. These findings suggest that although most communities demonstrate a moderate level of preparedness, gaps remain in preventing post-disaster health risks, particularly diarrhea. This study highlights the importance of strengthening community-based disaster preparedness programs and integrating post-flood public health interventions, including emergency response training, health education, and sanitation promotion. Such strategies may enhance community resilience and reduce disease vulnerability in coastal regions exposed to recurrent tidal flooding

Key Messages:

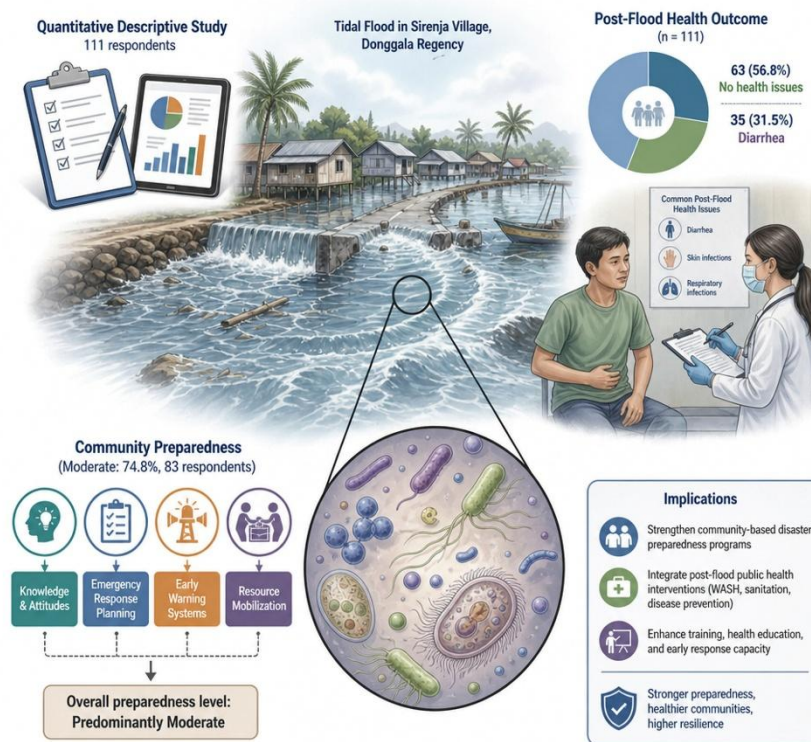
- Integrating targeted public health and sanitation interventions into existing disaster preparedness programs is essential for coastal communities like Sirenja Village to bridge the gap between moderate flood readiness and the ongoing risk of post-disaster illnesses such as diarrhea.

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GRAPHICAL ABSTRACT



INTRODUCTION

Indonesia is widely recognized as one of the countries with high disaster risk due to its unique geological and geographical setting (1). Indonesia's location at the intersection of three plates, namely the Eurasian plate, the Pacific plate and the Indo-Australian plate, also places Indonesia in a disaster-prone condition (2). Apart from that, according to Guha-Sapir (2019), in his review, wrote that Indonesia is the country with the most deaths due to disasters with a total of 4,535 deaths (3).

Apart from Indonesia's geographical location, other things, especially climate change, also influence disaster events in Indonesia. Climate change, rainfall and extreme weather also increase the incidence of disasters such as floods and droughts which increase the frequency and spread of diseases that affect so many people in the world due to disaster events (4). Apart from that, climate change also triggers the melting of glaciers on icebergs which results in a rise in sea levels (5). Rising sea levels trigger waterlogging on land, abrasion and also contribute to tidal floods or coastal flooding (6).

Tidal floods or coastal floods are floods that occur due to the influence of tides where sea water enters land areas when sea water is high (7). Apart from rising sea levels, tidal floods also occur due to land subsidence (8). Tidal flooding is a major problem in several areas in Indonesia, including the North coast of Java, Semarang, Jakarta and Pekalongan (2).

Central Sulawesi is also a region with a geographical location that is near the equator and has a long coastline and is prone to disasters ranging from tsunamis, floods, landslides, droughts, earthquakes and also tidal waters or tidal floods (9). The 2018 Palu–Donggala earthquake and tsunami in Central Sulawesi caused significant co-seismic ground deformation, including land subsidence along parts of the coastal area of Palu Bay. This tectonic deformation altered coastal elevation and bathymetry, which contributed to increased coastal vulnerability and recurring tidal inundation in low-lying settlements. Studies indicate that the combination of strike-slip fault movement along the Palu–Koro Fault system and localized subsidence intensified the exposure of coastal areas to post-disaster flooding hazards, including tidal flooding (rob) in several affected zones (10).

Donggala Regency is one of the districts in Central Sulawesi Province that was affected by the tidal (rob) flood disaster on 24 December 2022. The tidal flood hit five sub-districts including Sirenja District, Balaesang District, Balaesang Tanjung District, Sindue Tombusabora District and Central Banawa District. The tidal flood was triggered by tidal waves and strong winds. Although there were no fatalities, the tidal flood caused 150 houses to be hit by rocks, 3 houses of worship were damaged and 1 fish harvesting place was damaged (11).

According to Indonesian President Joko Widodo, the high incidence of disasters in Indonesia demands that the Indonesian people and the government, whether through BNPB or other means, be able to apply the principles of disaster management in their daily lives (1). Disaster management is a process that consists of three stages, namely pre-disaster, disaster and post-disaster. Disaster preparedness is part of disaster management, namely pre-disaster. Situations that are not prepared for disasters, even though these disasters often occur, result in these disasters having a huge impact on society (9).

Although previous studies have examined the impacts of tidal floods on coastal communities, most have focused on socioeconomic vulnerability, livelihood adaptation, or disaster mitigation strategies rather than community preparedness for post-flood health issues. Several studies have documented the physical, environmental, and socioeconomic consequences of tidal flooding and the adaptive strategies adopted by affected communities. However, evidence regarding community health resilience following tidal floods remains limited, particularly in Indonesia. Likewise, studies conducted in Central Sulawesi have primarily investigated disaster governance, health system disruption, and disaster preparedness in relation to earthquakes, tsunamis, and river floods rather than recurrent tidal flooding in coastal villages.

Therefore, this study aims to assess community preparedness for addressing health issues following tidal floods in Sirenja Village, Donggala Regency, by evaluating the level of community preparedness and identifying the prevalence of specific health problems experienced after tidal flood events. In addition, the study examines the role of village institutions in supporting community health preparedness and resilience. By providing empirical evidence on both preparedness levels and post-flood health conditions, this study contributes to a better understanding of community-based health preparedness and supports the development of evidence-based disaster risk reduction strategies for coastal communities vulnerable to recurrent tidal flooding.

METHODS

This research was carried out using a quantitative descriptive method with the aim of explaining community preparedness and health problems in facing tidal floods in Sirenja District, Donggala Regency. The aim of this research is to get an overview based on the distribution and frequency of community preparedness and health problems in Sirenja District, Donggala Regency, which is measured through several parameters. Data measurement was carried out using a questionnaire.

This study was conducted in Sirenja Village, Donggala Regency, an area frequently affected by tidal floods. The study population comprised 111 eligible residents who had experienced tidal flood events and met the study criteria. Because the target population was relatively small and accessible, a total sampling technique was employed, whereby all eligible individuals were invited to participate in the study. Consequently, all 111 eligible residents were included, eliminating the need for sample size estimation and ensuring complete representation of the target population.

The inclusion criteria were as follows: residents aged 18 years or older; permanent residents of Sirenja Village; individuals who had experienced at least one tidal flood event; and those who voluntarily agreed to participate by providing informed consent. The exclusion criteria included: temporary residents or visitors; individuals who were unable to communicate effectively or complete the questionnaire due to severe illness or cognitive impairment; and individuals who declined to participate or returned incomplete questionnaires.

The data sources used were secondary data and primary data. Secondary data came from the Tompe Community Health Center UPTD to obtain data related to post-disaster health problems. Primary data came from interviews using questionnaires with the community. The data obtained were analyzed for distribution and frequency based on categories of disaster preparedness and health problems.

The collected data were coded, entered, cleaned, and analyzed using IBM SPSS Statistics. Descriptive statistical analyses were performed to summarize the respondents' demographic characteristics, community preparedness levels, and the prevalence of health problems following tidal floods. Categorical variables were presented as frequencies and percentages, while continuous variables, where applicable, were summarized using means and standard deviations.

RESULTS

This research was conducted in Sirenja District, Donggala Regency, among communities affected by the tidal flood disaster.

Preparedness Parameters

The distribution of community preparedness indicators among the respondents, including knowledge and attitude, emergency response plan, early warning system, and resource mobilization, is presented in Table 1.

Table 1. Post-Flood Preparedness Parameters

Knowledge and Attitude	n	%
Good	60	54.1
Bad	51	45.9
Emergency Response Plan		
Good	66	59.5
Bad	45	40.5
Early Warning System		
Good	62	55.9
Bad	49	44.1
Resource Mobilization		
Good	61	55
Bad	50	45

The results of the study show that respondents' preparedness varied across four parameters. In the knowledge and attitude component, most respondents (54.1%) were categorized as having good preparedness, while (45.9%) were categorized as having poor preparedness. For the emergency response plan, (59.5%) of respondents demonstrated good preparedness, whereas (40.5%) showed poor preparedness. Regarding the early warning system, (55.9%) of respondents had good preparedness and (44.1%) had poor preparedness. In terms of resource mobilization, (55.0%) of respondents were categorized as good, while (45.0%) were categorized as poor. Overall, the findings indicate that the majority of respondents had relatively good preparedness across all measured parameters, although a substantial proportion still demonstrated inadequate preparedness.

Post-Flood Community Preparedness

Preparedness is one of the disaster management mechanisms as well as an effort to anticipate and reduce the consequences of disaster risks. Several activities carried out to increase preparedness are carried out by the community (13). The distribution and frequency of community preparedness when a disaster occurs is as follows table 2.

Table 2. Community Preparedness After Tidal Flooding

Category	n	%
Low	6	5.4
Moderate	83	74.8
Good	22	19.8
Total	111	100

Based on Table 2, data is obtained that from various indicators to see community preparedness, it can be concluded that the level of community preparedness is mostly still in the sufficient category with 83 respondents (74.8%), according to BNPB Preparedness is a series of activities carried out to anticipate disasters through organization and through appropriate and effective steps (14). To optimize community preparedness, it is necessary to hold training and simulations for the community to ensure that the community understands and is able to implement all aspects of implementing preparedness. This indicates a substantial concentration of respondents in the intermediate preparedness category, with a relatively limited proportion demonstrating high preparedness. The gap between the “Moderate” and “Good” categories suggests that although a considerable number of respondents have moderate preparedness, only a minority have achieved an optimal level of preparedness.

Post-Flood Public Health Problems

Health problems in post-tidal flood conditions are illnesses that people suffer from. The results of research on the variables of disease suffered were measured using a questionnaire with questions referring to post-flood health problems according to the Health Crisis Center (12). The results of the distribution of research variables based on the disease suffered are as follows table 3.

Table 3. Distribution of Diseases Suffered After Tidal Flooding

The type of disease	n	%
None	63	56.8
Diarrhea	35	31.5
Other	8	7.2
ARI	3	2.7
Dengue fever	1	0.8
Skin disease	1	0.8
Total	111	100

Based on Table 3, it is known that the majority of respondents did not experience illness after the tidal flood, 63 people (56.8%). However, there were 35 people (31.5%) of respondents who experienced diarrhea after the flood, apart from that there were also those who experienced skin diseases and dengue fever. This is in accordance with research by Christian et al. (15), who concluded that the most common post-flood diseases were diarrhea and skin diseases.

DISCUSSION

Preparedness Parameters related to Knowledge and Attitudes Post-Flood

Based on the research above, it was found that the majority of respondents had good knowledge and attitudes regarding preparedness. Knowledge and attitudes are the main factors that most influence a person's preparedness in facing disasters (16). Findings indicate that most respondents comprehend the nature of tidal floods and are aware of their early signs. Regarding attitudes, the majority of people feel that preparedness measures need to be taken in the face of tidal floods. This could be because the community has faced floods repeatedly so they feel the need to increase their preparedness to minimize the impact. The same thing was also stated by Suryadi et al. (17), which states that people who are directly affected by a disaster have higher preparedness compared to those who are not directly affected.

Preparedness Parameters related to the Emergency Response Plan Post-Flood

Based on the research above, it was found that the majority of respondents had carried out good emergency response activities. Good emergency response activities can reduce the impact of a disaster. Emergency response is carried out after a disaster occurs. In this research, it is known that people immediately rush to the evacuation location if a tidal flood occurs. In emergency response conditions, every activity is carried out quickly so that the emergency situation passes more quickly (18). Ministry of Public Works states that the aim of emergency response is to temporarily overcome damage from the threat of

flooding so that the impact does not spread and get worse, one of which is evacuating residents and property during floods and building temporary shelter for evacuees (19).

Preparedness Parameters related to the Early Warning System Post-Flood

Based on the research above, the majority of respondents are familiar with the early warning system. Good emergency response activities can reduce the impact of a disaster. With this disaster warning, the community can take appropriate action to reduce loss of life, property and environmental damage. For this reason, training and simulation are needed, what to do when you hear a warning, where and how to save yourself within a certain time, according to the location where the community is at the time of the warning(20).

Preparedness Parameters related to the Resource Mobilization Post-Flood

Based on the research above, it is known that the majority of respondents are aware that they are able to mobilize available resources, both human resources (HR), as well as funding and important infrastructure for emergencies, which are potential that can support or otherwise become obstacles in natural disaster preparedness. Therefore, resource mobilization is a crucial factor(21).

Post-Flood Health Problems

Based on the research above, it is known that the majority of respondents did not experience health problems after the tidal flood. However, there were several respondents who experienced post-flood diarrhea, apart from that there were also those who experienced skin diseases and dengue fever. This is in accordance with research by Christian et al. (15), who concluded that the most common post-flood diseases were diarrhea and skin diseases. Good preparedness in pre-disaster conditions in relation to the occurrence of a disease can be done by carrying out disease prevention. This prevention can be provided through outreach regarding diarrhea and how to prevent it as the disease most often suffered by people after floods. Something similar was also said by Sari et al. that providing outreach to the community regarding diarrhea prevention can increase community knowledge regarding disease prevention, which knowledge can increase preparedness in facing disasters (22).

The findings of this study indicate that community preparedness in Sirenja Village remains predominantly at a moderate level, with most respondents categorized as “Moderate” across key preparedness dimensions. When interpreted in relation to previous studies conducted in coastal and disaster-prone areas, these results suggest that although basic awareness and preparedness behaviors exist, significant gaps remain in achieving optimal community resilience. More importantly, this pattern has direct implications for disaster management policy in Central Sulawesi, particularly within the framework of the Regional Disaster Management Agency (BPBD) of Donggala Regency and BPBD of Central Sulawesi Province. Current disaster risk reduction programs implemented by BPBD, including community-based disaster preparedness training and early warning dissemination systems, appear to have reached communities at a basic level; however, the findings of this study indicate that these interventions have not yet fully translated into high-level preparedness outcomes.

This situation highlights the need for strengthening and recalibrating existing BPBD programs by shifting from general awareness campaigns toward more structured, continuous, and village-specific preparedness interventions. In particular, BPBD Donggala and BPBD Central Sulawesi should enhance the effectiveness of village disaster preparedness teams (Desa Tangguh Bencana) through regular simulation exercises, post-flood health response training, and integration of health-focused disaster modules into community programs. Furthermore, improving coordination between village apparatus, local health centers, and BPBD is essential to ensure that early warning systems are not only disseminated but also acted upon effectively at the community level. Strengthening these institutional linkages is crucial for translating moderate preparedness levels into improved community resilience and reducing the recurring health impacts of tidal floods in coastal areas such as Sirenja Village.

CONCLUSION

In conclusion, community preparedness for recurrent tidal floods in Sirenja Village, Donggala

Regency, is predominantly classified at a moderate level. Although the majority of the community exhibits adequate capabilities across key preparedness parameters—including knowledge and attitudes, emergency response planning, early warning systems, and resource mobilization—there remains a critical gap in achieving optimal disaster resilience. In terms of post-disaster health outcomes, while over half of the population reported no illnesses, a substantial proportion (31.5%) suffered from diarrhea, alongside other reported cases of skin diseases and dengue fever. These findings highlight the urgent need to integrate targeted post-flood public health interventions, particularly sanitation education and disease prevention, into existing community-based disaster preparedness programs. Ultimately, enhancing institutional coordination among village apparatuses, local health centers, and the Regional Disaster Management Agency (BPBD) through continuous, village-specific training is essential to transition these coastal communities to a highly resilient state capable of mitigating post-disaster health impacts.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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