

Exploring tsunami literacy levels among vulnerable groups in areas affected by the 2018 Anak Krakatau Tsunami, Indonesia

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Abstract

The end of 2018 marked a significant turning point for coastal communities in several areas of South Lampung, Indonesia. A key question remains: what is the level of awareness among those affected, particularly among vulnerable groups? This study aims to investigate tsunami literacy levels among vulnerable groups, specifically children, women, and the elderly. In conducting this investigation, a mixed-methods approach was used, involving questionnaires distributed to children (n = 80 respondents) and in-depth interviews with groups of women and the elderly (n = 11). Specifically, this investigation was conducted in the Rajabasa subdistrict across three villages Way Muli, Way Muli Timur, and Kunjir which were among the three villages severely affected by the tsunami at the end of 2018. During our investigation, we obtained specific data indicating that children's tsunami literacy levels were, in order, high (20%), moderate (61.25%), and low (18.75%), with an average of 64.06. Based on this data, the majority of them understand tsunami warning signs, but their knowledge of evacuation procedures remains limited. Meanwhile, among other vulnerable groups, such as women and the elderly, 10 out of 11 respondents demonstrated preparedness, a finding strongly supported by their prior disaster experiences. We can conclude from these findings that there is a need to strengthen tsunami preparedness through a participatory, culturally-based approach by integrating local cultural elements into disaster education programs in schools and local communities. We also highlight the urgency of strategies to enhance tsunami literacy to help them protect themselves in the face of future tsunami disasters.

Keywords: Children, disaster literacy, older adults, tsunami, women

Introduction

Most of Indonesia's coastal areas face various social and ecological challenges (Putri et al., 2024). Indonesia is highly vulnerable to subduction zone tsunamis because it lies along the Pacific Ring of Fire and has a long coastline. Additionally, the country is situated at the junction of the Indo-Australian and Eurasian tectonic plates (Jumadi et al., 2025). Coastal communities must also contend with additional risks such as storm surges, cyclones, and sea-level rise. These conditions

create a complex risk scenario and make coastal residents more vulnerable. Consequently, coastal communities place a high priority on enhancing their ability to adapt. Therefore, to improve preparedness and resilience, education on tsunamis and disasters is crucial (Nuraziz et al., 2023; Sahana et al., 2023).

With a coastline stretching 1,105 km and encompassing Lampung Bay and Semangka Bay, Lampung Province is highly vulnerable to tsunamis (Febrina et al., 2021; Susanti et al., 2023). The Sunda Megathrust lies near the southern part of Sumatra, which can trigger major earthquakes and tsunamis (Triyoso et al., 2024). Vulnerability levels are also influenced by physical attributes such as elevation, slope, land use, and distance from the coastline. Collectively, these factors determine the geographic distribution of tsunami risk along the coast. Consequently, certain locations face greater exposure and require a more focused mitigation approach. To develop effective strategies for reducing disaster risk, it is important to understand these geographical conditions (Fauzi, 2024; Gelfi et al., 2021; Mardika, 2024; Muzani, 2024).

The eruption of Anak Krakatau on December 22, 2018, triggered a significant tsunami, resulting in more than 16,000 people being displaced and 437 deaths (Dogan et al., 2021; Firdaus et al., 2022; Lahcene, 2021; Riantini et al., 2021). This event highlights the damage caused by non-tectonic tsunamis along the coast. Furthermore, it underscores deficiencies in community preparedness and emergency response capabilities. This disaster also increased the region's vulnerability to long-term vulcano-tectonic activity, a finding further supported by historical evidence of the 1883 Krakatau eruption. In several cases, improved disaster preparedness in Lampung is urgently needed (Genc et al., 2022; Ibtihaj et al., 2022; Ponangsera et al., 2021; Rezaldi et al., 2021; Suhadha et al., 2022).

According to several studies, improving disaster literacy is crucial, especially in high-risk areas, as it is linked to community preparedness and response capacity (Amato et al., 2024; Gani et al., 2023; Grau et al., 2024; Khairunnisa et al., 2021; Nagata et al., 2022; Rumambi et al., 2023; Sabani et al., 2021; Salah et al., 2021; Takahashi et al., 2025; Yusuf et al., 2024). Education, simulations, and the integration of technology into the learning process can enhance disaster literacy (Hasan et al., 2022; Kawamoto & Matsuda, 2023; Lin & Wu, 2021; Logayah et al., 2024; Nurdin et al., 2022; Santos & Ortega, 2023). In such situations, the integration of cultural practices, daily activities, and belief systems is crucial for effective disaster preparedness (Avci, 2023; Di Appleby et al., 2021; Ludovico et al., 2023). Local wisdom, which encompasses community practices, traditional housing, and cultural values, plays a significant role in mitigating the impact of disasters (Ananda et al., 2025; Fakhriati et al., 2023; Kurnio et al., 2021; Prasad et al., 2023). Such methods enable communities to better understand risks and respond more effectively. Therefore, combining formal education with local knowledge is considered an effective method for reducing the likelihood of disasters.

However, demographic and socioeconomic factors, such as age, gender, and prior experience, influence individuals' understanding of and response to disasters (Gülsoy et al., 2025; Han & Lee, 2021; Rahman et al., 2022; Torpus et al., 2024; Yusuf et al., 2022). Women and older adults are often reported to have lower levels of disaster literacy despite their involvement in social activities (Han & Lee, 2021; Kim & Park, 2023). Additionally, the spread of misinformation through digital platforms presents a growing challenge in disaster communication (Chen & Zhang, 2022; Lee & Kim, 2023). The provision of information alone without continuous training is often insufficient to build preparedness (Tanaka & Hasegawa, 2023). Furthermore, public understanding of tsunami causes has evolved over time, especially regarding volcanic triggers (Choo et al., 2024; Cong et al., 2023; Lee et al., 2024; Riskianingrum et al., 2022; Wicaksono et al., 2024; Yang et

al., 2023). Disaster literacy can therefore be enhanced through integrated education and learning environments such as museums (Aryani et al., 2025; Murti et al., 2023; Prasetyaningsih et al., 2025; Saregar et al., 2025).

Despite the growing body of literature, disaster literacy levels in many high-risk regions remain relatively low, even though higher literacy is strongly associated with improved preparedness (Erdoğan & Kaya, 2024; İşleyen et al., 2025; Tanaka & Hasegawa, 2023). However, existing studies tend to generalize findings and do not adequately address the specific socio-cultural contexts of vulnerable groups. This limitation is particularly relevant in tsunami-prone coastal areas such as Lampung. In these areas, local experience and knowledge play a crucial role in shaping preparedness. Nevertheless, limited empirical evidence exists on how children, women, and the elderly integrate local wisdom with formal disaster education. Therefore, this study aims to assess the level of disaster literacy among children (<15 years), women, and the elderly (>65 years) in coastal areas of South Lampung, and to examine the role of local wisdom and mitigation education in enhancing preparedness for tsunami hazards.

Method and study area

Design research

To gain a better understanding of disaster literacy among vulnerable coastal communities, this study employs a convergent mixed-methods design in which quantitative and qualitative data are collected during the same research phase. Tsunami preparedness is a multidimensional issue that requires measurable indicators and contextual explanations. Quantitative data were used to assess levels of knowledge, attitudes, and preparedness skills, while qualitative data were used to assess participants' experiences, perceptions, and local understanding of tsunami risks and responses.

The primary method for collecting quantitative data was a survey using a questionnaire tailored to the characteristics of the target groups, namely children, women, and the elderly. This survey aims to measure participants' knowledge, attitudes, and skills regarding tsunami risk mitigation and preparedness during evacuation. To complement the survey findings, qualitative data is collected through in-depth interviews and documentation. This method provides extensive insights into community experiences, the intergenerational transmission of knowledge, and a broader context regarding disaster literacy within the study area.

Study area

The study was conducted in the coastal region of Lampung Province, specifically in a high-risk tsunami zone. That is why the South Lampung Regency was selected for the study, due to its close proximity to the Sunda Strait, and then the tsunami of 2018 was recorded, causing severe destruction to the coast. The research then focused on three villages in the Rajabasa District, Way Muli, Way Muli Timur, and Kunjir, which were all part of the region most affected by the disaster in 2018. The combination of these three villages having direct disaster experience and their unique coastal geomorphology with high residential density, as well as varying levels of disaster preparedness from the communities, makes them ideal locations for research.

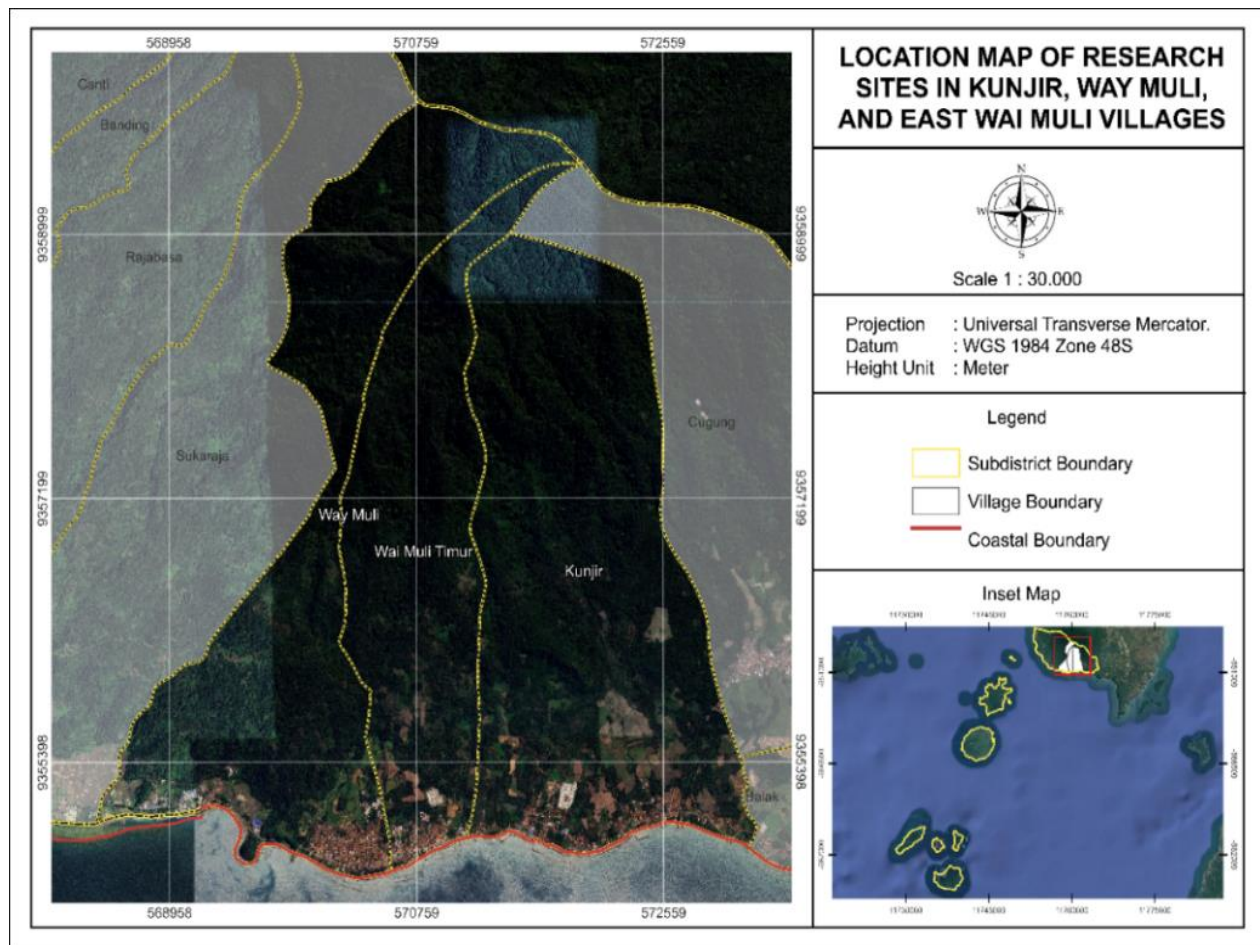


Figure 1. Research location map

Procedure research

The research procedure consisted of five main stages: (i) a literature review was conducted on disaster literacy, tsunami preparedness, and historical tsunami events in the study area. This stage also included the selection of research locations, namely Way Muli Village, East Way Muli, and Kunjir in South Lampung Regency. (ii) was instrument development, which involved preparing structured questionnaires for children and interview guidelines for women and the elderly. (iii) was field data collection, consisting of questionnaire distribution to children (80 respondents), in-depth interviews with women and elderly participants (11 respondents), and field observations. (iv) involved data analysis, where quantitative questionnaire data were analyzed descriptively, while qualitative interview data were interpreted thematically (v) was interpretation and conclusion, in which findings from both datasets were triangulated to strengthen validity and used to formulate the final conclusions regarding disaster literacy among vulnerable coastal communities.

The research participants came from the three villages that were affected by the 2018 Sunda Strait tsunami, including Kunjir, Way Muli, and Way Muli Timur in Rajabasa District. Disaster literacy data were collected from a sample of children (N=80) using a closed-ended questionnaires that assessed knowledge of tsunami danger, early warning signs and self-evacuation procedures.

The children were surveyed in the presence of teachers in the classroom. For women and the elderly, data were collected through in-depth interviews, and to target, questions around local knowledge and/or fogged memories of disaster event, including the warning signs, from the participants who were interviewed in their homes. Observations of coastal areas, evacuation pathways, and community mitigation measures were also assessed and, as with all procedures, the activities were conducted in compliance with the research ethical guidelines.

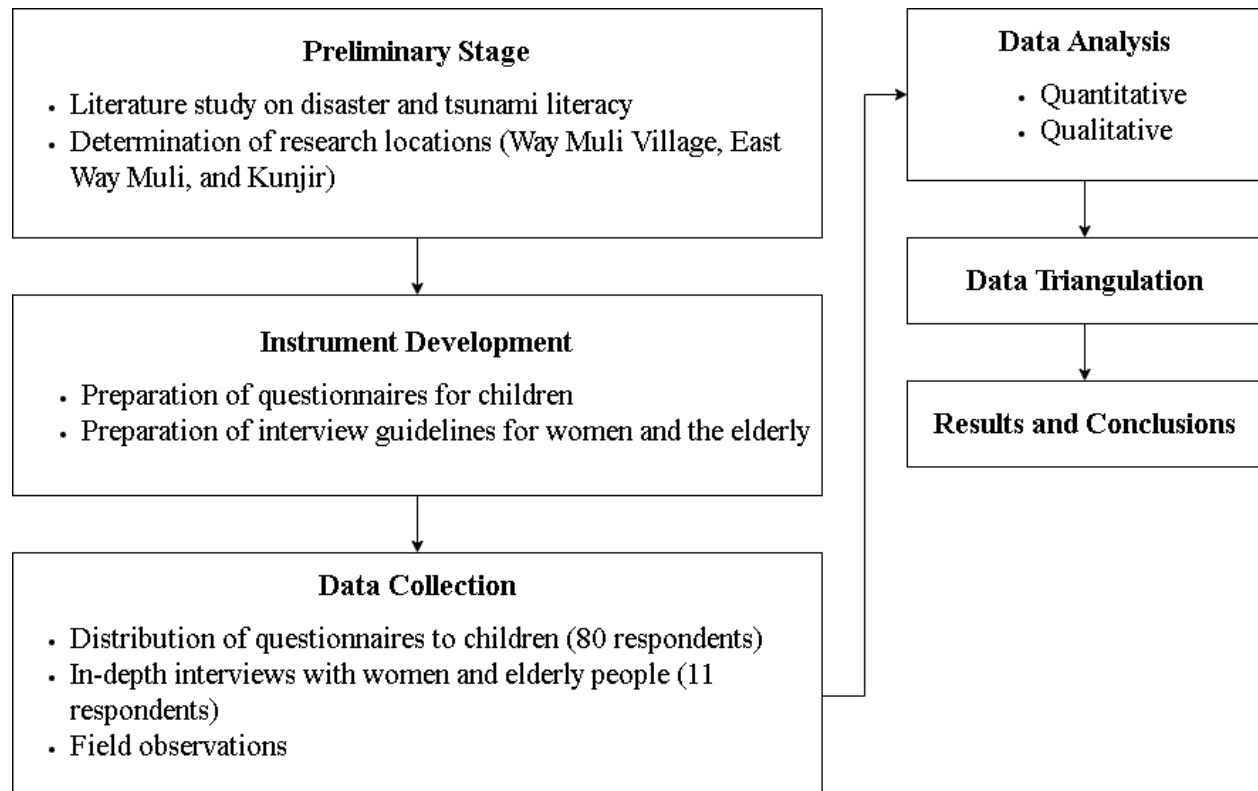


Figure 2. Research flowchart

To classify children's survey responses by literacy levels as low, moderate, or high, the data was processed using descriptive statistics. Interviews were subjected to qualitative thematic analysis, including data reduction, coding, categorisation, as well as the interpretation of community experiences and perceptions of risk with regard to tsunamis. To ensure validity, the data triangulation method was implemented using the combination of surveys, interviews, and observations. From the gathered data, the study delivered informative outcomes concerning the levels of literacy on disasters and its interrelation with historical contextual experiences and traditional knowledge, as well as the women and older members of the three villages affected by the 2018 Sunda Strait tsunami.

Participants

This study involved participants selected through purposive sampling from three coastal villages in South Lampung Regency namely Kunjir, Way Muli, and Way Muli Timur which were directly affected by the 2018 tsunami. The selection of these locations was based on their high level of

vulnerability and direct experience with the disaster. With a focus on three vulnerable groups children, women, and the elderly a purposive sampling method was used. Children were selected due to their cognitive vulnerability, women due to their social roles within the family and society, and the elderly due to the knowledge they have gained from life experience. In total, the participants consisted of 80 children (via questionnaire) and 11 women and elderly individuals (via in-depth interviews).

Instrument material

The two main tools used in this study were a disaster literacy questionnaire and a focus group interview guide. The questionnaire consists of fifteen multiple-choice questions presented in easy-to-understand and contextually relevant language, designed to measure children's disaster literacy regarding knowledge, attitudes, and behaviors related to tsunami hazards. It is intended to assess understanding among elementary school children in the coastal regions of Lampung. Three aspects were addressed in the questionnaire: (1) pre-tsunami preparedness, including recognizing tsunami warnings and preparing emergency supplies; (2) response during a tsunami, including finding a safe location and following evacuation procedures; and (3) post-tsunami recovery behaviors, including helping others, maintaining hygiene, managing emotions, and taking care of oneself.

To ensure the quality of the instrument, the questionnaire was reviewed and validated by experts in the fields of geography education and disaster education. These experts also ensured that the questionnaire's content was relevant, clear, and appropriate for children. Furthermore, reliability was tested using Cronbach's alpha coefficient, which yielded a value of 0.93, indicating adequate internal consistency. The second instrument was a focus group interview guide used to explore the perspectives of women and the elderly regarding disaster experiences, local knowledge, preparedness practices, and community responses to tsunami risk.

Data collection from women and older adults concerning their lived experiences and local knowledge regarding tsunamis, sign, and warning tsunamis and tsunamis, and warning sign and tsunamis was conducted using the in-depth interview guide. Several indicators were included in the interviews: (1) recounting experiences during and after the disaster; (2) description of emotional and social responses; (3) mitigation of community support and practiced customs; (4) local wisdom preservation. To give respondents the chance to share their experiences, interviews were conducted face to face and in a dialogic manner. Before they were submitted for use in the field, the two instruments were reviewed for cultural adaptation, and local relevance to coastal communities, as well as clarity and accuracy, by specialists in disaster mitigation and language.

Data analysis

The techniques for analyzing the data corresponded with the objectives of the study, the data that were collected, and the methodological approaches used. analysis consisted of two main aspects: qualitative and quantitative. In this case, quantitative analysis was used for the numerical data obtained from the children's questionnaires to ascertain the levels of literacy in relation to the tsunami disaster, which was done through percentage evaluations. Hence, the results included tables and graphs that presented the data in such a manner that would allow the identification of levels and patterns or trends in disaster literacy among children.

Regarding the data obtained from the women and older people, a descriptive qualitative approach was adopted. The data gathered through interviews and observations were analyzed in a

descriptive manner to provide a detailed account of their understanding, experiences and attitudes regarding the risks of a tsunami. The qualitative approach applied was through data reduction, data presentation and conclusion drawing, which allowed literacy levels to be contextualized in relation to the social and lived experiences of the respondents.

Results and discussion

How is the literacy rate among young people (< 15 years of age)?

The goal of this research is to determine the tsunami disaster literacy of children under 15 years old, one of the most vulnerable populations in the tsunami-prone areas of South Lampung Regency. Children are the focus of this research because in cases of emergencies, they are physically smaller with less experience, which often leads to an extended gap in timely decision-making. Thus, determining their disaster literacy is important in knowing whether they are able to identify tsunami warning signs, evacuate the area, and employ basic mitigation strategies.



Figure 3. Child participants from the vulnerable group

As a consequence of a study conducted on 80 children aged 15 and younger and living in coastal Rajabasa District, South Lampung Regency, it was found that the tsunami disaster literacy level among children is moderate. The mean was 64.06, the median score was 65, the mode was 95, and the standard deviation was 26.89 due to the mean, and the descriptive statistical analysis calculation showed that there is a deviation of the children's understanding of the rudiments of a tsunami and what self-evacuation tactics to employ were quite deviant. The level of literacy in children is summarized in Table 2.

Table 2. Categories of children's tsunami literacy levels

Category	Formulation	Interval	Frequency	Percentage
Low	$X < M - 1SD$	$X < 37,162$	15	18,75
Medium	$M - 1SD \leq X \leq M + 1SD$	$37,162 \leq X \leq 90,95$	49	61,25
High	$X > M + 1SD$	$X > 90,96$	16	20,00
Total			80	100,00

Source: Widodo et al., 2025

As shown in the table, the most common classification for the children, 61.25%, is the median category. This suggests that the majority of participants have some basic knowledge regarding the tsunami hazard, its warning signs, and the basic steps to take for evacuation. 20% of the children belong to the class of having a high degree of literacy, meaning this is an even lower percentage that possesses a comprehensive knowledge and understanding that is likely impacted by experience in some disaster simulations or even contextual learning lessons. At the same time, the percentage of the children that fall in the low category is 18.75%, meaning this segment of the population is still highly vulnerable and lacks understanding in even the most basic self-rescue steps that can be taken during a tsunami.

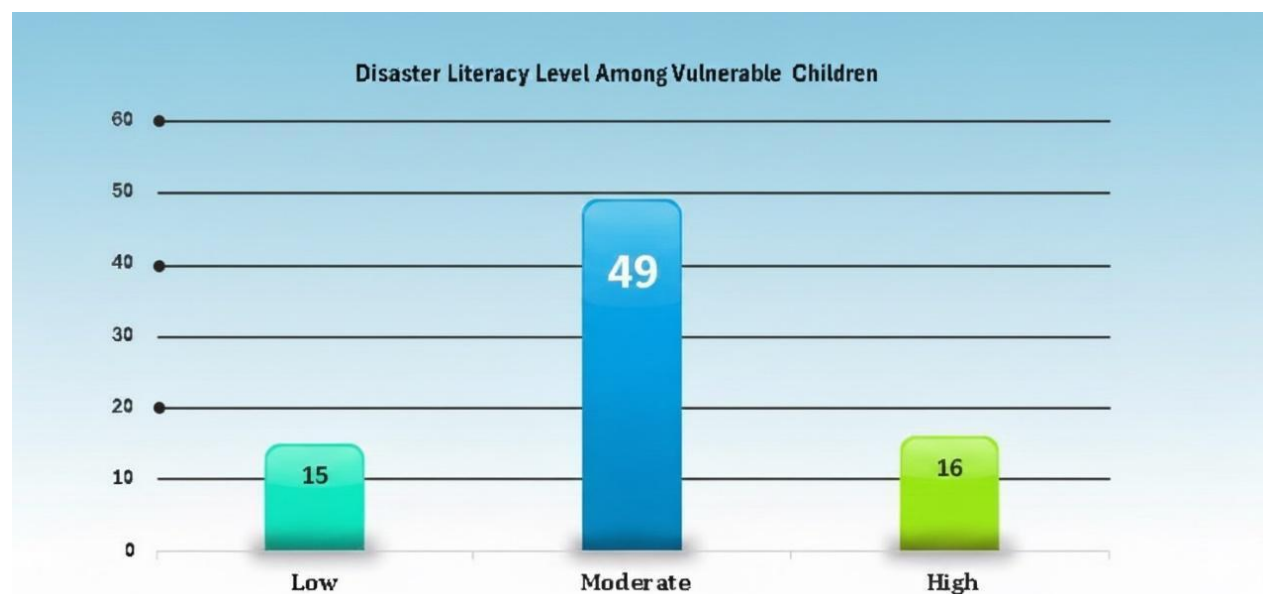


Figure 4. Literacy levels of child participants in the vulnerable group

This distribution illustrates that, in general, children in coastal regions of South Lampung are moderately acquainted with the concepts of tsunamis and the steps needed to lessen the effects of tsunamis. Yet, not all are capable of implementing what they have learned. The results also indicate the need to refine custom made education interventions to consider the divergent outcomes. Generally, children with little literacy skills come from background where the

informational content is also minimal, or where they have never undergone any training in the event of a disaster directly.

In general, these outcomes highly indicate the need to fortified disaster literacy to school and communities intersection, as this knowledge is a critical building block to mitigating and preparing for disaster risks. Active, participatory and experiential learning has been shown to be the most effective in creating a change in the knowledge, attitude and skills of children in adaptive response to hazards. Between the theory and the values of disaster preparedness and appropriate response, children with evacuation drills, PBAs and contextual learning games are able to internalize the concepts of disasters.

How is the literacy rate among the female community and older adults (>65 years of age)?

This research study focused on women and older adults residing in tsunami-prone coastal areas of South Lampung Regency and comprised a total of eleven participants. Due to their advanced age and physical and social limitations, these groups are especially vulnerable to the negative consequences of disasters and have little access to pertinent disaster-related information. The researchers constructed a Likert-scale questionnaire, performed in-depth interviews, and compiled and analyzed field documents to obtain data on the participants' knowledge, attitudes, and behaviors regarding the tsunami threats, which include the coastal field documents showing the evacuation routes and the community mitigation measures undertaken by the respondents.

The research findings indicate that women and older adults have a relatively high level of preparedness (10 out of 11 participants), particularly in terms of disaster response practices. Although disaster literacy is not yet uniformly established in conceptual terms, this has led to a gap between formal understanding of disaster mitigation and direct experience. Participants' testimonies indicate that they have an adequate understanding of the tsunami threat and that they are capable of taking action in an emergency. "I took my children to a safe, elevated place and stayed there until the siren stopped sounding and the seawater stopped receding," said a 34-year-old female participant. Such statements demonstrate sufficient knowledge of disaster preparedness taught in school and passed on to families.



Figure 5. Women and older adult participants from the vulnerable group

Elderly people, especially those who survived the 2018 tsunami, were reported to have a greater sense of vigilance. Such lived experiences contribute to a more complex understanding of

disasters. A 70-year-old woman explained, "When the waves suddenly calm and the sea retracts a long way, that is a warning sign to me. I take my grandchildren to safety. I never wait for the water to come." Such knowledge is embedded through oral tradition and is a component of natural literacy which fosters preparedness of the next generation in coastal areas.

Every respondent claimed to have knowledge of tsunamis from both formal and informal sources. Families, neighbors, and social media sources were the most frequent. Some also reported using television and the internet. A 41-year-old housewife explained, "I often get to know through mothers' WhatsApp groups and radio when a high-wave warning is issued." Such communication patterns in the community highlight the tsunami literacy awareness in social circles and daily practices, especially in coastal areas.



Figure 6. High ground location as a tsunami evacuation area

A majority of the respondents also exhibited proactive mitigation behaviors in their everyday routines. Tsunami hazard exposure was minimized by relocating to relatives on the hill or higher ground. One respondent stated, "We moved to a relative's house on the hill. It's farther away, but at night, especially when we get high wave news, it feels safer." Furthermore, there were economically disadvantaged households who had prepared cross-disaster emergency packs with clothing, essential items, and important documents, and those who had not prepared them at all. This demonstrates that in the community, some level of awareness of preparedness has been attained but its practical application has been inconsistent at the household level.

Residents' participation in the evacuation drills was uneven. Some had had some training in exercises conducted by the National Disaster Management Authority (BNPB) and Local Government, while some only received some general instructions or informal training. Nevertheless, most of them knew the evacuation routes and were quick to react to the tsunami alarm. A respondent, a 38 year-old female, said "We already know the route to the hill behind. We just run, and while helping some mothers, we're transporting small children." Disaster literacy, she described, was not just knowing, but was also having the social literacy to act in association and be civil in a consolidated manner in times of peril.

After the evacuation, the majority of residents refrained from going home until it was completely safe to do so. They systematically placed the safety of themselves and family in front of their material belongings. The community also demonstrated the importance of physical and mental well-being by maintaining personal hygiene, taking adequate rest, and praying to stay calm in order to manage the anxiety of the situation. One mother (45 years) shared, “Once safe, I have the children pray first to calm down while we stay in a safe place, and then we change clothes.” Such behaviours show that tsunami literacy, while having the knowledge and procedural/thought skills, also should have the emotional and spiritual aspects to be able to improve the strength of the individual and community to cope in a situation after a disaster.



Figure 7. Tsunami evacuation route signage and breakwater in the study area

Post disaster recovery efforts saw the participation of women and the elderly as well, cleaning the area, distributing aid, and doing disaster outreach from the local council building. This involvement shows that the so-called 'disaster vulnerable' are also the ones bolstering the social structure's ability to endure. With their participation, disaster literacy became praxis and improved the community's ability to respond to the catastrophes that the community has to endure. The findings indicate that although participants demonstrate a relatively high level of preparedness, their conceptual understanding of disaster literacy remains uneven, highlighting a gap between experiential knowledge and formal disaster education.

Discussion

In the coastal areas of South Lampung Regency, children have a moderate level of tsunami disaster literacy, with an average score of 64.06. These results reflect the spatial vulnerability of coastal communities in areas at high risk of tsunamis. Their geographical proximity to the coastline, the area's geomorphological conditions, and settlement density are all factors that influence this vulnerability. Limited access to disaster education and an uneven risk communication system exacerbate the high coastal risk. Additionally, ongoing human-environment interactions, such as settlement activities and dependence on coastal resources, influence how communities understand, perceive risks, and respond to tsunami disasters.

This indicates geographical disparities in terms of exposure to disaster education and varying risk information among coastal communities. These conditions indicate that location, the availability of educational infrastructure, and the frequency of disaster awareness campaigns influence children's disaster literacy levels. Furthermore, these differences suggest that the disaster literacy capabilities of certain groups in more vulnerable areas are not necessarily better. Consequently, more focused and context-specific educational interventions are required.

The data distribution pattern reinforces these findings, as the majority of children demonstrated excellent literacy levels, and approximately 20% of respondents scored between 95 and 100. These score differences indicate disparities in the disaster education process. Thus, Kawasaki's (2023) study found that children who had experienced a disaster firsthand, particularly a tsunami, tended to have a better understanding of how to reduce disaster risk. Educational games, evacuation route simulations, and early warning systems are some examples of experience-based learning approaches that are crucial to implement. Therefore, it can be concluded that integrating simulations and interactive media can improve disaster literacy education more effectively.

Children with low literacy levels indicate that teachers and local policymakers are not paying attention to them. This is unacceptable and of critical importance. This is odd, since the majority of children demonstrate moderate to high literacy levels. Literacy-limited children often come from backgrounds that are information-poor, or from families whose parental units have little or no education on disaster. Harada et al. (2023) confirms this. Additionally, disaster education directed at children is known to have spillover advantages onto the families of those children. In other words, children who have knowledge of disaster risks are able to educate their parents, thereby underscoring and widening the scope of school education to promote community resilience.

Alongside educational components, the influence of social and psychological factors are equally important. Children in areas vulnerable to tsunamis can be afflicted with the trauma and anxiety of future tsunamis. This type of trauma can affect how children perceive and process information concerning disasters. Sheehy et al. (2024) state that inclusive disaster literacy programs that are sensitive to the children's emotional states are more successful in instilling long-term awareness and preparedness. Hence, in the coastal areas, disaster education should focus more on the non-cognitive psycho-emotional components of trauma, than on the purely rational-core academic components of the education.

The observed distribution pattern appears to reflect moderate disaster literacy scores suggesting that disaster literacy programs are implemented at schools; however, they appear to be missing segments of the student population. Citizens must comprehend their vulnerabilities, and functional capacities to adapt, and remain robust to external threats to mitigate the effects of a disaster. Innovations in the learning technologies and the adaptation of local curricula to include a risk focus are essential. Press works in Augmented Reality, as noted by Herowati et al. (2022), have been effective in improving students' achievement and interest in disaster materials. Disaster literacy among the children of the coastal area of South Lampung should be significantly high and uniform among all the school children. This will be possible with the effective use of contextual technology.

Understanding the warning signs of a threat and the need for prompt exit strategies to secure safety (i.e., early evacuation) were topics with above benchmark knowledge for women. Information on risks were obtained through women's children's schools, social media, and village situation reports. This demonstrates how long-term interaction with the coastal environment contributes to the development of place-based disaster knowledge. Having this knowledge,

however, does not equate to actual understanding due to passive, non-continuous learning. Aspects of the home (i.e., domestic responsibilities), a lack of time, and absence of practical training were highlighted as the primary barriers. These results resonate with findings by Rafliana et al (2021), where it was stated that women living in coastal areas of Indonesia had a fair level of disaster knowledge, however, the women were restricted due to family obligations, and a lack of support from relevant authorities, or lack of institutional support.

Furthermore, Kusumawati et al. (2022) mention that community social arrangements as well as community involvement influence women's disaster literacy in coastal areas. Women continue to be passive recipients of risk information as opposed to active decision-makers. However, women sustain disaster knowledge at the household level, especially as they educate children and other family members. Therefore, training, evacuation drills, and community program involvement are strategies necessary to empower women and increase local preparedness.

For the older age cohort, disaster literacy is largely experiential and through social memory. In-depth interviews show that older adults who had previous experiences of tsunami events had greater awareness of risks than those who had not. However, in the absence of family support, physical frailty, and cognitive decline, there are important obstacles to carrying out mitigation actions. This agrees with Nakagawa et al. (2022) where it was shown that experience is the main source of disaster literacy in older adults in Japan. However, it is important to highlight that age and health conditions limit the capacity to respond to an emergency in a timely manner.

In addition, Pratiwi et al. (2023) note that information about disasters should be conveyed to older individuals through visual showing and repetitive messaging, since older individuals process symbols, colors, and images more easily than long narratives. These techniques can attenuate the stress and confusion that older individuals commonly feel when given information that is technical. Most older respondents in South Lampung coastal areas in the study recollected evacuation routes better when information was given through maps and visual documentation than when descriptions were given.

The women's intergenerational roles in disaster education as described in the study hinge on the women being the communicators of risk in the families to the children and adults and the older people being the collective holders of place history and local events. These findings relate to other studies (Izumi et al., 2021) which also noted intergenerational learning as a valuable pedagogy for building community resilience in Asia. A knowledge construct focused on disaster literacy traversing generations is engendered by the interactions of the skilled older community members and the women performers of care. Mustakim et al. (2020) demonstrated studies on the simulation programme that led to disaster education across all the concerned strata because of the tsunami vulnerability which relates to the community's adaptive potential (Effendi et al., 2025).

Conclusion

This research shows that societal tsunami disaster literacy in the coastal zones of South Lampung is comparatively higher than other regions with notable differences of this literacy by age stage. These findings highlight the importance of considering spatial vulnerabilities and coastal risk exposure when designing disaster education strategies for high-risk communities. While children can identify the sudden recession of the sea and the sounding of alarms they need to be taught proper self-rescue behaviors. Research shows that women and the older age cohorts also have higher literacy. The older cohorts are the keepers of the local informal knowledge from the prior

experiences. Women, in turn, are more active in those roles because they have children and participate in informal learning of the child and in community development activities. This indicates that disaster literacy is the result of more than formal education, and is also the product of individually constructed experience, community social structure, local knowledge, and traditional wisdom.

There are some qualities of this study that should be acknowledged. It is impossible to generalize the results of this study to the entire coastline of Indonesia due to the fact that the interview participants were solely from one coastal area. The time frame during which the data were collected was also problematic, as it was too short to document and develop lasting changes in the level of disaster literacy within the population of the coastal area studied. Future research should focus on a broader and more heterogeneous population, including members from various age cohorts and different SES classes. Certain types of quantitative and qualitative research designs can help facilitate more in-depth and comprehensive investigations. Educational programs tailored to the cultural traditions and practices of coastal communities will also be crucial for improving disaster literacy and community preparedness.

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