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Differences in Earthquake Preparedness Knowledge and Attitudes After Sticker Media Among Padang Health Polytechnic Students

Mutia Anggraini Juva[1], Widdefrita[2], Evi Maria Lestari Silaban[3]
[1,2,3] Applied Undergraduate Program in Health Promotion, Politeknik Kesehatan Kemenkes Padang, West Sumatra, Indonesia
e-mail: mutiaanggraiinijuva@gmail.com

ABSTRACT

Abstract: Background: Indonesia lies at the junction of three active tectonic plates and is prone to earthquakes, including the magnitude 7.6 event that struck West Sumatra in 2009. Students need adequate preparedness knowledge and attitudes to act as agents of disaster preparedness. This study examined differences in earthquake preparedness knowledge and attitudes among Politeknik Kesehatan Kemenkes Padang students after exposure to sticker media. **Methods:** A mixed-methods design was used, with a quasi-experimental one-group pre-post test as the primary component and in-depth interviews as the secondary component. From a population of 850 students, 85 were selected by proportional random sampling. Knowledge and attitudes were measured with 10-item questionnaires before and after the stickers were sent twice via WhatsApp. Three informants were interviewed to guide the sticker design. Data were analyzed with a paired t-test. **Results:** Mean knowledge increased from 6.66 to 8.92 and mean attitude increased from 33.9 to 42.8 (both $p<0.001$). Informants recommended content based on self-rescue procedures, bright colors (orange and green), and placement on classroom doors or walls. **Conclusion:** Knowledge and attitudes differed significantly before and after the sticker media. Sticker media can be considered an information channel for earthquake preparedness on campus; further studies with a control group are needed.

Keywords: *knowledge; attitude; sticker media; earthquake preparedness; health promotion*

Introduction

Background

Indonesia has one of the highest disaster risks in the world. Geologically, the country lies between three active tectonic plates, namely the Pacific, Eurasian, and Indo-Australian plates, whose interaction produces volcanic eruptions and earthquakes (Utomo, 2018). The National Disaster Management Agency (BNPB) recorded 515 earthquakes across Indonesia between 1828 and 2017, with the highest number in 2009 (54 events and 1,286 fatalities) (Hakim, 2019). In the same year, an earthquake of magnitude 7.6 on the Richter scale, centered in Padang Pariaman at a depth of 81 km, struck West Sumatra (Sanjiwani, 2016). It caused 809 deaths, 241 missing persons, 891 severe injuries, 1,366 minor injuries, and 410 displaced people, along with damage to houses and infrastructure in 12 districts and cities (Savira & Suharsono, 2013).

To reduce such risks, the Padang City government has held earthquake and tsunami simulations every month since February 2013. Politeknik Kesehatan Kemenkes Padang supports these efforts through its institutional flagship program, established in 2018, which includes disaster preparedness. The institution runs a disaster preparedness student activity unit, broadcasts preparedness information as voice recordings, conducts earthquake and tsunami simulations, and

prepares students to join preparedness training. Students are expected to become drivers of preparedness in the community, which requires sound knowledge and understanding on their part.

A 2020 survey of 300 students of the institution found that 47% had high preparedness knowledge and 53% had low knowledge, while 61% had good attitudes and 39% had less favorable attitudes (Widdefrita, 2020). Preparedness knowledge among these students was therefore relatively low.

Literature Review

Promotive and preventive efforts are part of health promotion and can reduce the risk of casualties when a disaster occurs. One strategy is to empower students through sticker media, that is, sheets of paper, large or small, that can be affixed to surfaces. In disaster preparedness, stickers serve as an information medium that conveys knowledge and attitudes on how to anticipate disasters, and they can be read each time students pass facilities to be avoided or used during an earthquake.

Previous studies support the use of educational media and training for preparedness. Daud et al. (2014) reported that hands-on disaster preparedness training that mimicked actions during an earthquake improved knowledge, attitudes, and actions among the community of a senior high school in Banda Aceh. Wati et al. (2019) found significant differences ($p < 0.001$) in knowledge and in attitudes of elementary school students before and after receiving the booklet "Gercep Kebumi" on earthquake preparedness. Marsiatun (2016) reported that a poster on flood preparedness was rated feasible by two expert validators (73.86%) and improved learning outcomes in the affective, cognitive, and psychomotor aspects. Theoretically, knowledge results from sensing an object, largely through sight (Notoatmodjo, 2010), and, in the stimulus-organism-response (S-O-R) theory, behavior change depends on the quality of the stimulus given (Notoatmodjo, 2014).

Research Gap

The preparedness information currently available on campus does not reach all students. Informants in this study reported that the voice recordings are played at set times on weekdays, that preparedness training is attended only by class representatives, and that the campus has evacuation symbols but no printed medium explaining earthquake preparedness in detail. The studies cited above examined training, a booklet, and a poster; evidence on sticker media for university students appears limited.

Novelty and Rationale of the Study

This study combined a quantitative pre-post test with in-depth interviews. The interviews were used to design the sticker with informants after the pre-test, so that the content, language, color, and placement matched student needs and the knowledge gaps identified in the pre-test. A sticker can be seen repeatedly in daily activity areas, which makes it a plausible medium to complement the existing voice recordings and training.

Research Objectives

The general objective was to determine differences in earthquake preparedness knowledge and attitudes among Politeknik Kesehatan Kemenkes Padang students after exposure to sticker media. The specific objectives were to (a) describe mean knowledge before and after the sticker media, (b) describe mean attitude before and after the sticker media, (c) test the difference in mean knowledge, (d) test the difference in mean attitude, and (e) obtain information on a sticker design that fits

student needs. The hypotheses were that mean knowledge and mean attitude differ significantly before and after the sticker media.

Methods

Study Design

This study used a mixed-methods design. The quantitative component was a quasi-experiment with a one-group pre-post test approach and served as the primary method. The qualitative component used in-depth interviews to obtain detailed information on the process of designing the sticker and served as the secondary method that supported the statistical results. Both components were carried out concurrently at the same place and time (Sugiyono, 2015).

Research Location and Timeline

The study was conducted from 30 April to 23 May 2021 among students of the main campus of Politeknik Kesehatan Kemenkes Padang, located in Nanggalo, Padang, West Sumatra, Indonesia.

Population and Sampling Technique

The population comprised 850 students of the main campus. Following the suggestion that 10–15% or more can be sampled when the population exceeds 100 (Arikunto, 2019), the sample was 10% of the population (n = 85). Proportional random sampling was used, with the sample allocated to each study program as $n_i = (N_i / N) \times n$: D3 Sanitation 15, D3 Nutrition 11, D3 Nursing Padang 15, D4 Environmental Health 11, D4 Nutrition 14, D4 Health Promotion 11, and Nurse Profession (Ners) 8 students.

The inclusion criteria were students who were willing to participate and signed the informed consent form, who had not studied disaster management, who were active students, and who studied on the main campus. The exclusion criteria were students who were absent during data collection or who were on practice placements outside the campus. For the qualitative component, three informants were selected by purposive sampling: the disaster preparedness coordinator (main informant 1), a general staff member of the disaster preparedness team (main informant 2), and a student who had attended disaster preparedness training (triangulation informant).

Data Collection Procedures and Instruments

Quantitative data were collected with a questionnaire containing 10 knowledge questions (correct = 1, incorrect = 0; possible score 0–10) and 10 attitude statements (five-point scale scored 1–5, reversed for negative statements; possible score 10–50). The pre-test questionnaire was distributed directly to respondents and the post-test questionnaire was distributed online through Google Forms. Item validity was tested by correlating each item with the total score ($r = 0.654–0.988$, above the r table value of 0.632), and reliability was acceptable with Cronbach's alpha above 0.6 for all variables (Arikunto, 2019; Riyanto, 2011). Qualitative data were collected through in-depth interviews guided by an interview guide, with a notebook, voice recorder, and camera.

The pre-test was administered from 30 April to 6 May 2021. In-depth interviews were then held on 7 May (main informant 1) and 10 May (main informant 2 and the triangulation informant) to design the sticker. The sticker was developed and produced following the P-Process steps, approved by the informants, and printed at 16 cm × 20 cm in landscape format. It was sent to all respondents

through WhatsApp twice, on 17 and 19 May 2021 (two distributions within three days). The post-test was administered from 20 to 23 May 2021.

Statistical Analysis

Quantitative data were edited, coded, entered into Microsoft Excel, cleaned, and transferred to SPSS. Univariate analysis described the mean of knowledge and attitude before and after the intervention. Normality was assessed with the Kolmogorov-Smirnov test because the sample exceeded 50 (Notoatmodjo, 2012). Differences before and after the intervention were tested with a paired t-test at a 95% confidence level, and a p-value below 0.05 indicated a significant difference. Qualitative data were processed through data reduction, data display, and conclusion drawing, and analyzed with source triangulation.

Scope and/or Limitations of the Methodology Used

The study covered knowledge and attitudes regarding earthquake preparedness and the sticker medium among students of one campus. The one-group design has no control group, and the qualitative component was limited to three informants. These points are discussed further under Limitations.

Results and Discussion

Results

Respondent characteristics

A total of 85 students participated. Most were aged 18–20 years (57.6%) and female (84.7%). Respondents came from seven study programs, with the largest groups from D3 Nursing Padang and D3 Sanitation (15 students each; 17.6%) (Table 1).

Table 1. *Characteristics of respondents (n = 85)*

Characteristic	n	%
Age (years)		
18–20	49	57.6
21–23	36	42.4
Sex		
Male	13	15.3
Female	72	84.7
Study program		
D3 Sanitation	15	17.6
D3 Nutrition	11	12.9
D3 Nursing Padang	15	17.6
D4 Environmental Health	11	12.9
D4 Nutrition and Dietetics	14	16.5
D4 Health Promotion	11	12.9
Nurse Profession (Ners)	8	9.4

Knowledge and attitude before and after the sticker media

Mean knowledge increased from 6.66 before to 8.92 after the sticker media, a difference of 2.26 points. Mean attitude increased from 33.9 to 42.8, a difference of 8.9 points. Paired t-tests showed significant differences for both knowledge and attitude ($p < 0.001$), so the null hypotheses were rejected (Table 2).

Table 2. *Knowledge and attitude before and after the sticker media (n = 85)*

Variable	Measurement	Mean	Min–Max	Mean difference	p-value
Knowledge (0–10)	Before	6.66	3–10	2.26	<0.001
	After	8.92	6–10		
Attitude (10–50)	Before	33.9	18–50	8.9	<0.001
	After	42.8	32–50		

Note. Paired t-test; 95% confidence level.

At item level, the knowledge question about what to do during a strong earthquake had the lowest proportion of correct answers before the intervention (27%, 23 students) and rose to 81% (69 students) afterwards. The question about what to do when an earthquake occurs rose from 54% (46 students) to 96% (82 students). Two items (numbers 1 and 2) showed no increase. For attitude, the lowest mean item scores before the intervention concerned sheltering in the "triangle of life" (3.01), using emergency stairs as an evacuation route (3.02), and preparing medicines and safety equipment in a preparedness bag (3.24). After the intervention these rose to 4.41, 4.61, and 3.61, respectively, and every attitude item showed a higher mean.

Sticker design from in-depth interviews

The interviews were held after the pre-test so that the pre-test results could inform the design. Table 3 summarizes the main findings. The revised sticker, which incorporated the informants' suggestions, is shown in Figure 1; its panels present the self-rescue steps for earthquakes on the ground floor, on upper floors, when there is no time to evacuate, and when a tsunami is possible.

Table 3. *Summary of in-depth interview findings used to design the sticker*

Aspect	Findings
Existing information	Preparedness information is given as voice recordings played at 08.00 and 16.00 on weekdays, training attended by class representatives, a disaster preparedness student unit, and regular earthquake and tsunami simulations.
Perceived gaps	Not all students know the preparedness procedures; the voice recordings could not be heard by all students, especially during the pandemic; the campus had evacuation symbols but no detailed medium such as a sticker.
Content	The standard operating procedure for earthquake self-rescue: move out of the building and protect the head on the ground floor; move to a higher place on upper floors; take cover under sturdy objects or in the "triangle of life" and avoid glass if there is no time to evacuate; gather at the building shelter and await commands if a tsunami is possible.
Language and color	Formal but easy-to-understand language; striking colors such as orange, green, or red.
Placement	In classrooms, on classroom doors, on classroom walls, or on bulletin boards.

Aspect	Findings
Perceived effectiveness	All informants considered the sticker attractive and effective as an information medium.



Figure 1. *Earthquake preparedness sticker (final design; text in Indonesian)*

Discussion

Knowledge

Mean knowledge rose significantly after the sticker media. Before the intervention, knowledge was low, which the interviews and the authors attribute to the limited time available to deliver information and the shortage of printed media. The voice recordings are played during lecture hours, when students concentrate on studying, and some students were not on campus because lecture schedules differ and teaching was affected by the pandemic, so the information did not reach them effectively. Knowledge is the result of sensing an object, and most human knowledge is acquired through the eyes (Notoatmodjo, 2010). A sticker is a visual medium that can be seen at any time, so the increase is consistent with this theory. The finding is also consistent with Wati et al. (2019), who reported significant differences in knowledge after a booklet, and with Marsiatun (2016) and Daud et al. (2014), who reported improvements from a poster and from training, respectively. The content of the sticker was short, clear, and easy for students to understand. The two knowledge items that did not improve suggest that the sticker did not convey that information well and that its content should be reviewed.

Attitude

Mean attitude also rose significantly. The low pre-test attitude was linked to unclear delivery of preparedness information and to training that reached only class representatives, so other students were less familiar with appropriate actions during an earthquake. According to Notoatmodjo (2014), under the S-O-R theory behavior change depends on the quality of the stimulus, and attitude

changes when the new stimulus exceeds the initial one. In this study the stimulus was a set of actions to take during an earthquake, presented concisely on the sticker. The result is in line with Wati et al. (2019), who also found significant differences in attitude, and with Marsiatun (2016).

Design process

The sticker was designed with the P-Process steps used in health communication: (1) analyzing the problem and audience through the pre-test; (2) designing the medium from the pre-test and interview results; (3) developing and producing the sticker; (4) implementing and monitoring, with two distributions within three days; and (5) evaluating through the post-test. The informants' suggestions on content (the standard operating procedure for self-rescue), color (orange and green, the colors of the disaster management agencies according to one informant), formal language, and placement (classroom doors, walls, and bulletin boards) were incorporated into the final design.

Implications

The sticker can complement the existing voice recordings and training by providing a visual reminder that is available to all students, including those who do not attend training. The way the sticker was developed, starting from a pre-test and involving the people who manage preparedness, can serve as a model for other health promotion media on campus.

Research Contribution

This study provides pre-post evidence from a mixed-methods study on the use of sticker media for earthquake preparedness among university students in a high-risk area, together with a documented design process and a finished sticker that other institutions can adapt.

Limitations

The one-group pre-post design has no control group, so the increases cannot be attributed to the stickers alone, and the repeated questionnaire may have influenced post-test answers. The post-test followed the intervention within days, so retention is unknown. Pre-test and post-test were delivered in different modes (paper and Google Forms), the stickers were distributed digitally through WhatsApp rather than posted on campus, and exposure to the stickers was not independently verified. Data were self-reported, the sample was drawn from one campus, and the qualitative component involved only three informants.

Suggestions

Politeknik Kesehatan Kemenkes Padang is encouraged to use the sticker as an information medium on earthquake preparedness, including physical placement in classrooms. Future studies should compare sticker media with other media to find the most effective way to raise knowledge and attitudes, and should add a control group and a longer follow-up period.

Conclusion

Mean knowledge increased from 6.66 to 8.92 and mean attitude from 33.9 to 42.8 after the sticker media, and both differences were statistically significant ($p < 0.001$). A sticker design that matched student needs was obtained through in-depth interviews. These findings support the use of sticker media as part of earthquake preparedness information for students, and the recommendations above can guide campus practice, with confirmation from studies that include a control group.

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Author Contribution Statement

[Please complete: the contribution of each author, e.g., conceptualization, data collection, analysis, writing, and supervision.]

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