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VALIDITY AND RELIABILITY OF COGNITIVE AND AFFECTIVE INSTRUMENTS FOR DISASTER CADRES

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ABSTRACT

Background: Health cadres have great potential to play an important role in disaster preparedness and early response, especially in areas prone to volcanic eruptions. However, to support the effectiveness of this role, a valid and reliable instrument is needed to evaluate the level of knowledge and attitudes of cadres in dealing with disasters. This instrument is important as a basis for developing a comprehensive and needs-based disaster preparedness training program. Therefore, this study aims to assess the accuracy and consistency of the disaster preparedness knowledge and attitude instrument for health cadres. **Methods:** This cross-sectional study involved 75 health workers in areas prone to eruptions of Mount Merapi. The instrument was developed based on a literature review and tested for content validity, construct validity, and internal consistency reliability. **Results**: The results show that all items are declared valid and reliable, with KR-20 values for knowledge ranging between 0.750–0.791 and Cronbach's Alpha for attitudes ranging between 0.653–0.706. **Conclusions**: This instrument can be used as a reliable measurement tool to assess the preparedness of health cadres for disasters. Its use has the potential to support more targeted training planning and increase the capacity of cadres to respond effectively to disasters. Furthermore, this instrument can assist policymakers and training facilitators in mapping needs and evaluating the impact of interventions to improve preparedness on an ongoing basis.

Keywords: attitude, disaster preparedness, health cadres, knowledge, reliability.

Introduction

Indonesia is one of the countries prone to natural disasters such as earthquakes, tsunamis, and volcanic eruptions. This is due to the geological and geographical conditions of Indonesia which is located in the Pacific Ring of Fire, with more than 129 active volcanoes spread from Sumatra to Maluku. (Kamaluddin et al., 2019). One of the most active and high-risk volcanoes is Mount Merapi, located on the border of the Special Region of Yogyakarta and Central Java. Within the framework of community-based disaster management (Community-Based Disaster Risk Reduction/CBDRR), village health cadres play an important role as the spearhead of disaster preparedness at the community level. Health cadres are trained volunteers who actively contribute to primary health

services, including in the pre-disaster and emergency response phases.

Their closeness to the community makes health cadres a strategic component in education, early detection, and rapid response to disasters (IFRC, 2022; Kamaluddin et al., 2019). However, the effectiveness of the role of health cadres in disaster preparedness is highly dependent on the cognitive and affective competencies they possess. Cognitive competency refers to knowledge relevant to potential hazards, evacuation mechanisms, and first aid, while affective competency includes attitudes, empathy, concern, and mental readiness in dealing with emergency situations (Alim et al., 2015; Tiepolo & Braccio, 2020). To ensure the success of training programs and educational interventions, valid and reliable evaluation instruments are needed to measure these aspects comprehensively.

The validity and reliability of the instrument are the main foundations in ensuring that the measuring instrument can truly represent the intended concept and provide consistent results in various situations (Gregory, 2015). In the context of assessing the preparedness of health cadres, several previous studies have developed and tested multidimensional instruments, such as that conducted by Kamaluddin et al., (2019) who developed a disaster preparedness knowledge instrument with 41 questions in six domains, and proved its content validity and internal reliability (Cronbach's α = 0.785–0.807).

However, instruments that specifically measure the cognitive and affective dimensions of health cadres in disaster preparedness are still very limited and have received little attention in academic literature. Most previous studies have focused more on the development of psychomotor skills or practical actions in disaster management, such as assistance and first aid. Meanwhile, evaluation of critical thinking skills, conceptual knowledge, and emotional readiness and attitudes of cadres in facing disasters have not been adequately studied. In fact, a study by Alim et al., (2015) showed that knowledge and attitude-based training significantly improved the readiness of nursing students in disaster situations. Similar findings were also expressed by Sumunar, (2018) that increasing students' skills and awareness in disaster response is obtained through strengthening cognitive and affective aspects during training. However, until now there have not been many instruments designed and validated specifically to measure these two aspects in the context of health cadres, even though their position is very strategic in the community.

Therefore, in an effort to improve the effectiveness of disaster preparedness training, it is very important to develop and test valid and reliable instruments to measure the cognitive and affective aspects of health cadres. These instruments are not only important as evaluation tools, but also as a basis for compiling more targeted and needs-based training curricula and materials. This study aims to test the validity and reliability of cognitive and affective instruments for disaster preparedness for health cadres in

disaster-prone areas of Mount Merapi eruptions. It is hoped that the availability of reliable instruments can improve the quality of training and the overall capacity of community preparedness.

Methods

Instrument Development

The instrument was developed based on a literature review, referring to research by Kamaluddin et al., (2019) to measure two dimensions of health cadre preparedness: knowledge (cognitive) and attitude (affective) in facing the Mount Merapi eruption disaster. The cognitive dimension includes: (1) disaster concept, (2) disaster preparedness, and (3) cadre roles; while the affective dimension includes: (1) self-efficacy, (2) cues to action, (3) vulnerability, (4) barriers, (5) benefits, and (6) severity.

Each dimension consists of 13 items: knowledge using a true–false format, and attitude using a 4-point Likert scale. Validity was assessed through expert judgment on three disaster and emergency threat categories, using the Aiken's V coefficient. All items had values >0.88, indicating relevance and suitability for use.

Participants

Respondents consisted of 75 active health cadres residing in areas prone to eruptions of Mount Merapi, specifically Glagaharjo Village, Sleman. The sample selection method used total sampling due to the limited population and homogeneity in terms of role and location. Inclusion criteria included active cadres who had never received formal disaster training and were willing to participate in the study. Exclusion criteria included respondents who did not complete the questionnaire or experienced communication barriers.

Procedures

Data collection was conducted during October–November 2023. The researchers were assisted by two field assistants who had been trained in instrument delivery procedures and research ethics. Questionnaires were printed and distributed directly to respondents at integrated health posts (Posyandu) and village halls. Guided interviews were conducted after obtaining approval from the village government and the local community health center (Puskesmas). All respondents signed informed consent before completing the questionnaire. This study received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine and Public Health, Gadjah Mada University (FK-KMK UGM) (No. KE/FK/1224/EC).

Data analysis

Data were analyzed using SPSS version 25.0. The initial stage included checking the completeness of the data and cleaning duplicate data. Descriptive analysis was used to describe the characteristics of the respondents. Construct validity was assessed through biserial correlation (for knowledge) and Pearson Product Moment (for attitude). Items were declared valid if r-count ≥ r-table at 5% significance. The selection of this method was based on the nature of the data and the purpose of testing the

relationship between items and total scores. Internal reliability was calculated using KR-20 for knowledge and Cronbach's Alpha for attitude. According to Dr. Sugiono, (2019) a reliability value of ≥ 0.60 is acceptable, especially in initial or exploratory research like this.

According to Dr. Sugiono, (2019) in the book "Quantitative, Qualitative, and R&D Research Methods", a reliability value of ≥ 0.60 can still be accepted as reliable, especially if the instrument is used in initial or exploratory research.

Results

Demographic Characteristics

This study involved 75 respondents, the majority of whom were female, namely 62 people (82.7%), while male respondents numbered 13 people (17.3%). The average age of respondents was 44.48 years with a standard deviation of ±9.22 years, which shows that the age range of respondents is quite varied. Most respondents had junior high school education or equivalent as many as 34 people (45.3%), followed by high school graduates or equivalent as many as 27 people (36%), elementary school graduates as many as 12 people (16%), and only 2 people (2.7%) who had a diploma as their last education. The average length of time as a cadre was 8.27 years with a standard deviation of ±3.063 years, indicating that most respondents had had quite a long experience as cadres. However, all respondents had never participated in disaster training before.

Table 1. Respondent Characteristics

Respondent Characteristics		Frequency (n)	Percentage (%)	Mean ± SD
Gender	Male	13	17.3	
	Female	62	82.7	
Age (Years)		-	-	44.48 ± 9.22
Education	SD	12	16	
	SMP	34	45.3	
	SMA	27	36	
	Diploma	2	2.7	
Length of time as a cadre (Years)		-	-	8.27 ± 3,063
Disaster training that has been attended	Pernah	0	0	
	Belum pernah	75	100	

Validity and Reliability Test

Validity assessment was conducted using biserial correlation for knowledge instruments and Pearson Product Moment for attitude instruments, by correlating the score of each item to the total score. The test items were declared valid if the r-count value ≥ r-table (0.227; n = 75; α = 0.05). Based on the test results, all items on both instruments met the criteria and were declared valid.

The reliability of the knowledge instrument was tested using the Kuder Richardson Formula 20 (KR-20), with values ranging from 0.750–0.791. Meanwhile, the reliability of the instrument was tested using Cronbach's Alpha, with values between 0.653–0.706. A KR-20 value above 0.70 indicates that the items on the knowledge instrument have high internal consistency, while a Cronbach's Alpha value above 0.60 on the attitude instrument indicates acceptable reliability, especially in the context of exploratory research. Overall, these results indicate that both instruments have good sound and are suitable for measuring the preparedness of health cadres consistently.

Table 2. Results of Validity and Reliability Test of Knowledge Instrument (Cognitive)

No	Statement	r-count	r-table	Chronbach's Alpha	Notes
The concept of disaster					
1	Disasters can be caused by natural, non-natural and human factors	0.572	0.227	0,765	Valid
2	Tornadoes, floods, earthquakes, volcanic eruptions are examples of disasters caused by natural factors	0.495	0.227	0.773	Valid
3	The alert status of Mount Merapi is a condition where there is smoke coming out of the crater and there is an earthquake that is felt in the area around the mountain.	0.469	0.227	0.775	Valid
Disaster preparedness					
4	Self-protection initiative action is one of the disaster preparedness activities.	0.572	0.227	0.768	Valid
5	Identification of the dangers of volcanic eruptions can be done by paying attention to the presence of rivers flowing from their source in the vicinity.	0.385	0.227	0.768	Valid
6	Involving yourself by participating in disaster training is an effort at disaster preparedness.	0.537	0.227	0.778	Valid
7	Disaster preparedness bag (TSB) is one of the items of equipment that must be prepared in disaster preparedness.	0.598	0.227	0.768	Valid
8	Kentongan is a traditional instrument that can no longer be used as a disaster warning communication tool.	0.512	0.227	0.763	Valid
9	Disaster preparedness training is an effort to reduce the impact of disasters.	0.572	0.227	0.791	Valid

The role of health cadres					
10	Health cadres play a role in preparing basic maps of disaster-prone areas in villages/sub-districts.	0.521	0.227	0.779	Valid
11	Health cadres play a role in coordinating with related parties in determining evacuation routes and signs.	0.600	0.227	0.762	Valid
12	Health cadres play a role in providing first aid to disaster victims in their environment.	0.475	0.227	0.773	Valid
13	Health cadres play a role in helping vulnerable groups (the elderly, children, pregnant women, people with special needs, chronic illnesses (disabled) and people with mental disorders) to evacuate in disaster situations.	0.711	0.227	0.750	Valid

Table 3. Results of Validity and Reliability Test of Attitude Instrument (Affective)

No	Statement	r-hitung	r-tabel	Cronbach's Alpha	Keterangan
1	I am unable to make disaster evacuation plans for people in my neighborhood.	0.428	0.227	0.706	Valid
2	I can determine the risk of danger in my environment, such as the risk of being affected by volcanic ash and hot lava.	0.584	0.227	0.656	Valid
3	I am unable to carry out rescue operations when a disaster occurs.	0.592	0.227	0.654	Valid
4	I am able to determine a safe place for temporary evacuation in my environment when a disaster occurs.	0.583	0.227	0.662	Valid
5	People have explained to me the need to make personal plans for emergencies/disasters.	0.640	0.227	0.653	Valid
6	Newspapers, brochures and disaster-related guidebooks are not enough to meet my information needs.	0.516	0.227	0.667	Valid
7	I don't find emergency/disaster preparedness important to me.	0.412	0.227	0.702	Valid
8	I believe that there is a possibility that I will experience an emergency/disaster situation in my life.	0.474	0.227	0.675	Valid

9	Preparing for disaster preparedness is a good thing for me even though it can take up my time.	0.333	0.227	0.694	Valid
10	In a disaster situation there is no need to try anything, because if my destiny is to die in an emergency/disaster situation, I will still die.	0.520	0.227	0.667	Valid
11	My planned emergency/disaster preparedness planning will help me in an emergency/disaster situation.	0.427	0.227	0.683	Valid
12	An emergency/disaster situation will not change my life one bit.	0.639	0.227	0.668	Valid
13	I am worried about dying if an emergency/disaster occurs.	0.459	0.227	0.691	Valid

Discussion

Health cadre preparedness in facing disasters is one of the important elements in a community-based disaster risk reduction system. Cadres have a strategic role as a liaison between health service facilities and the community, especially in the pre-disaster phase and during emergency response. Therefore, valid and reliable measuring instruments are needed to assess their abilities, especially in the dimensions of knowledge (cognitive) and attitude (affective), so that training and intervention programs can be designed appropriately (IFRC, 2022; Kamaluddin et al., 2019).

In the knowledge instrument, there are 13 statement items that measure the preparedness of cadres in the cognitive aspect. Among them, there are 3 items about the concept of disaster, 6 items about disaster preparedness, and first aid, 4 items about the role of health cadres. The results of the validity and reliability tests show that all items have r-count > r-table and the KR-20 value is in the range of 0.750–0.791, which means that this instrument has adequate internal consistency. All of these items are designed to describe the knowledge competence of cadres in responding to emergency conditions systematically and quickly. Adequate knowledge is very important to ensure that cadres are able to identify and assess the situation correctly when a disaster occurs, so that they are able to take the right action (Bazyar et al., 2019).

Knowledge of disaster preparedness possessed by health cadres will greatly assist in reducing the risk of errors, speeding up the evacuation process, and minimizing further deaths and complications. In emergency conditions, cadres as part of the local community have great potential to become first responders who carry out identification, initial rescue, and distribution of evacuation information (Permana et al., 2022). The knowledge of the cadres is also very important because they are often the first responders before the professional medical team arrives at the location. Therefore, they must have an understanding of rescue priorities, who needs to be helped first, and when to ask for additional help.

The attitude instrument in this study consisted of 13 items that evaluated the cadre's attitude towards disaster preparedness, including Self-efficacy, Cue to action, Susceptibility, Barriers, Benefits, and Severity. All items were declared valid, with an r-count value > 0.227 and a Cronbach's Alpha value between 0.653–0.706, indicating that this instrument can measure attitudes with good consistency.

A positive attitude towards disaster preparedness is an important factor that influences the real actions of cadres in emergency situations. Attitudes reflect how individuals perceive responsibility and urgency in the context of disasters (Wolf et al., 2019). The more positive the cadre's attitude, the more likely they are to demonstrate responsive and proactive behavior in helping the community.

In the Social Cognitive Theory proposed by Bandura (1991), Self-efficacy or a person's belief in their abilities plays a

major role in encouraging changes in attitudes and behavior. Cadres with high self-confidence tend to be more mentally prepared and more alert in carrying out their roles. Research by Alkalash et al., (2023) shows that the self-confidence of health workers is positively correlated with disaster preparedness.

In addition, the cadres' attitudes towards the use of correct procedures and PPE also reflect their understanding of the importance of personal safety. Lillywhite & Wolbring, (2022) stated that responder safety is fundamental to a disaster management system, and a positive attitude towards this can reduce the risk of injury or fatigue while on duty.

The findings in this study reinforce the importance of developing local context-based instruments, which can be used by health offices, health centers, or disaster organizations in objectively assessing cadre readiness. The existence of valid and reliable instruments allows data-based decision making for training, intervention evaluation, and community resilience program planning.

However, this study has several limitations. The instrument developed and tested involved only a sample from one geographic area, namely Glagaharjo Village on the slopes of Mount Merapi, with relatively homogeneous population characteristics (active health cadres in disaster-prone areas). This limits the generalizability of the results to broader contexts, such as areas with different types of disasters or non-cadre groups such as the general public, novice volunteers, or cross-sectoral officers. Furthermore, this instrument has not been tested longitudinally or compared with other measurement methods such as skills observation or disaster simulations.

For further development, it is recommended that this instrument be tested on more diverse populations and regions, and cross-validation analysis conducted to strengthen the stability of the instrument's structure. Developing a digital version or adapting it to local languages could also increase its accessibility and wider applicability.

Conclusion

This study shows that the instrument for measuring knowledge (cognitive) and attitudes (affective) of health cadres in disaster preparedness has good validity and reliability. All items in both instruments show r-count values > r-table and have reliability coefficient values above 0.60, indicating that this measuring instrument can be used consistently and accurately to assess cadre preparedness in disaster-prone areas. The knowledge instrument reflects the cadre's mastery of basic disaster concepts, early warning systems, evacuation, and first aid procedures. Meanwhile, the attitude instrument is able to identify mental readiness, social awareness, and responsibility of cadres in carrying out their roles in the field. Thus, this instrument can be used as a tool in evaluating training needs, compiling educational intervention modules, and monitoring and evaluating community-based disaster risk reduction programs.

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