ORIGINALES

Community stress facing multiple disasters during the volcanic eruption and the covid-19 pandemic: a cross-sectional study

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ABSTRACT:
Primary Goal: This study is to determine stress during the COVID-19 pandemic and dealing with volcanic eruptions and analyze the related factors.
Methods: This research was an analytic observational quantitative with a cross-sectional design. The number of samples was 352 patients using the accidental sampling technique. The research instrument uses the Perceived stress scale (PSS)-10 items and the COVID-19 Stress Scale. Kendal Tau and Chi-Square tests were used for data analysis.
Results: Most respondents experienced mild stress during the COVID-19 pandemic (66.2%) and moderate stress when dealing with volcanic eruptions (98.9%). Variables related to stress during a pandemic were gender (p.017), education (p.027), income (p<.001), and distance from home to the top of the volcano (p<0.036), while those related to the stress faced Volcanic eruptions are just a training disaster experience (p.033).
Conclusions: The study found that the stress level of facing a volcanic eruption was higher than during the COVID-19 pandemic. Gender, education, income, and distance from home to the top of a volcano are related to stress during a pandemic. At the same time, the experience of disaster training is the only factor associated with stress in dealing with volcanic eruptions.

Keywords: COVID-19; Disasters; Stress; Volcanic eruption.

RESUMEN:
Objetivo: Este estudio tiene como objetivo determinar el estrés durante la pandemia de COVID-19 y afrontar las erupciones volcánicas y analizar los factores relacionados.

Métodos: Esta investigación fue de tipo observacional analítica cuantitativa con un diseño transversal. El número de muestras fue de 352 pacientes mediante la técnica de muestreo accidental. El instrumento de investigación utiliza la escala de estrés percibido (PSS) -10 ítems y la escala de estrés COVID-19. Para el análisis de los datos se utilizaron las pruebas Kendal Tau y Chi-Cuadrado.

Resultados: La mayoría de los encuestados experimentaron estrés leve durante la pandemia de COVID-19 (66,2%) y estrés moderado al lidiar con erupciones volcánicas (98,9%). Las variables relacionadas con el estrés durante una pandemia fueron género (p.017), educación (p.027), ingresos (p<.001) y distancia desde casa hasta la cima del volcán (p<0.036), mientras que las relacionadas con el estrés que enfrentan las erupciones volcánicas es sólo una experiencia de desastre de entrenamiento (p.033).

Conclusiones: El estudio encontró que el nivel de estrés al enfrentar una erupción volcánica era mayor que durante la pandemia de COVID-19. El género, la educación, los ingresos y la distancia desde el hogar hasta la cima de un volcán están relacionados con el estrés durante una pandemia. Al mismo tiempo, la experiencia de la formación en desastres fue el único factor asociado con el estrés al afrontar las erupciones volcánicas.

Palabras clave: COVID-19; Desastres; Estrés; Erupción volcánica.

INTRODUCTION

Disasters and mental health are closely related; The negative impact of disasters on society causes distress, anxiety, depression and other post-disaster problems. Disasters are socioeconomically detrimental and threaten safety and security, making victims vulnerable to mental problems[1]. Natural, technological or human conditions can cause disasters. Knowing the causes of a disaster is essential to distinguish the level of psychopathology during and after a disaster. Systematic review and meta-analysis studies found that natural disasters increase psychological distress and psychiatric disorders[2].

Volcanic eruptions, like natural disasters, arrive suddenly with a destructive power according to the magnitude of the eruption, leaving people with no opportunity to adapt to face them psychologically. This condition causes more significant emotional effects, ranging from feelings of hopelessness to mild to severe mental disorders[3]. Several studies have reported the impact of volcanic eruptions on mental problems, including stress, such as in Iceland[4], Japan[5], and the Democratic Republic of the Congo[6]. In a volcanic eruption, the victim is usually transported and evacuated to safety at the evacuation site. Victims with a relatively large number placed in one location require special treatment so as not to cause new problems[3].

Disasters due to volcanic eruptions can cause multiple problems in pandemic conditions such as COVID-19. COVID-19, an infectious disease with a high number of exposed patients worldwide, followed by a high mortality rate, is a cause of stress in society. Previous studies have shown that the COVID-19 pandemic causes stress at all levels of the organization[7]. Additionally, rash victims who experience stress are at risk of serious, permanent complications and disrupted life processes. Perceived stress causes decreased concentration, irritability, anxiety, insomnia and lack of productivity. In addition, other effects of stress can weaken people, making them very susceptible to diseases[8].

Review studies affirm that exposure to multiple disasters causes significant effects on public health, including mental problems[9]. The effects of double or multiple disasters on mental health, especially stress, are still limited. Blackmon et al.[10] found psychological alterations in victims of Hurricane Katrina and the Deepwater Horizon oil

spill. Research conducted in the Philippines on the typhoon disaster during the COVID-19 pandemic showed a high level of stress and anxiety among female students[11]. Researchers are struggling to find research on the twin disasters of COVID-19 and volcanic eruptions and their effects on mental health. The researchers found that the study by Wakhid et al.[12] investigated post-traumatic stress disorder due to the 2010 Mount Merapi eruption, which took place when the COVID-19 pandemic occurred. Based on this, researchers intend to explore how stressed people are during the COVID-19 pandemic and volcanic eruptions and the factors associated with this stress.

METHODS

This type of research is quantitative with an observational analytical survey using a cross-sectional design. The independent variables are age, gender, education, income, distance from home to the volcano, health insurance, training experience, distance from home to health facilities, and information about COVID-19. The dependent variable is stress related to volcanic eruptions and the COVID-19 pandemic. The population is adults living in the Merapi volcano area, Yogyakarta, Indonesia, numbering 1,589 people. Calculation of the number of samples using Slovin's formula, namely,

$$n = \frac{N}{N\,(d^2) + 1}$$

With details n=number of samples, N=population number, d=precision, the researcher used 5.0%. The number of samples after the minimum calculation is 320 people. A total of 352 respondents participated in the study. According to the inclusion criteria, the samples coincided in being surveyed who were between 26 and 45 years old and working. Exclusion criteria for people who have a history of mental disorders, use psychotic and similar drugs, have orientation disorders and are or have been positive for COVID-19. Sampling by accidental sampling.

The research instrument used a questionnaire consisting of 3 parts, namely parts A, B and C. Part A contains questions on the characteristics of the respondents, date of birth, gender, last education, health insurance, distance from home to volcano, attendance at disaster training, income during the COVID-19 pandemic, distance from home to health facilities, and information about COVID-19. Part B contains a questionnaire to measure stress due to volcanic eruptions. Stress was measured using the Perceived Stress Scale (PSS) questionnaire[13] with ten statements of 3 aspects: unpredictability, a feeling of uncontrollability and a feeling of overload. Response options used a Likert scale with the options "never," "rarely," "sometimes," "often," and "very often." Stress due to volcanic eruptions is classified as mild (score 0-13), moderate (14-26) and severe (27-40). Part C is a questionnaire to measure COVID-19 pandemic stress. Stress was measured using the COVID-19 Stress Scale (CSS) questionnaire[14], which includes 36 items in 6 aspects: danger, socioeconomic consequences, xenophobia, contamination, traumatic stress and compulsive control. Response options using a Likert scale are "never," "rarely," "sometimes," "often," and "very often." Stress is classified as none (score 0-35), mild (score 36-71), moderate (72-107), and severe (108-144). The results of the validity test of the PSS instrument obtained r = 0.43-1 and the reliability test with Cronbach's Alpha α = 0.95. The results

demonstrate that the instrument is valid and reliable. The validity of CSS instruments in English has been tested previously, with results >0.29 and reliability tests >0.83 for each aspect. The questionnaires were translated into Indonesian, and a content validity test was carried out among experts in psychiatry and disaster nursing with a mean score of 0.88.

The study was conducted in Yogyakarta, Indonesia, where the research site is located at the foot and slopes of Mount Merapi. Mount Merapi is one of the world's most active volcanoes, with persistent eruptions of different scales. The research was carried out for one month, from June 25 to July 26, 2022. The study was carried out when the COVID-19 pandemic still showed significant numbers and Mount Merapi was in full eruption. Before the investigation, the researcher coordinated with the COVID-19 management unit and the regional disaster management agency to obtain guidance and understanding of the procedures carried out during the study. Researchers collect data directly by distributing questionnaires to respondents. A total of six research assistants assisted in distributing the questionnaire to the respondents after receiving a detailed explanation of the research process from the researcher. The researcher visited the respondents individually at their homes so that the entire process of completing the questionnaire was directly accompanied. Each respondent took an average of 20 minutes to complete the questionnaire. The whole data collection process continues to pay attention to procedures to prevent the spread of COVID-19.

Respondents received an explanation of the entire research process, objectives, benefits, rights and obligations before signing the informed consent. Respondents who wish to participate in the research accredit this by signing the informed consent. The data was collected after obtaining ethical eligibility results from the Ethics Commission of Universitas Respati Yogyakarta with number 081.3/FIKES/PL/V/2022 and a permit from the Regional Government of Sleman, Yogyakarta with number 342/V/2022. Univariate data are presented in a frequency distribution. Bivariate test all aspects of stress during the COVID-19 pandemic and how to deal with volcanic eruptions using Kendall Tau. Bivariate tests to test different characteristics of each respondent with stress during the COVID-19 pandemic and dealing with volcanic eruptions using Kendall Tau and Chi-Square. Comparison between stress during the COVID-19 pandemic and facing a volcanic eruption based on the characteristics of the respondents using Chi-Square.

RESULTS

Table 1 Distribution characteristics of the respondent (N=352)

Characteristics of Respondent		n	(%)
Gender	Men	176	(50.0)
	Women	176	(50.0)
Age (years)	Early adulthood	223	(63.4)
	Late adulthood	129	(36.6)
Education	Elementary	45	(12.8)
	Junior High School	98	(27.8)
	Senior High School	183	(52.0)
	University	26	(7.4)
Monthly income	≤ IDR 2,500,000	216	(61.4)
	> IDR 2,500,000	136	(38.6)

Distance of house to top of Mount Merapi (km)	<5	2	(0.6)
	5-15	342	(97.2)
	>15	8	(2.3)
Health insurance	National Health Insurance	208	(59.1)
	Private insurance	14	(4.0)
	Combination	4	(1.1)
	No	126	(35.8)
Experience of disaster training	Yes	124	(35.2)
	No	228	(64.8)
Distence of house to health facilities (km)	<2 km	33	(9.4)
	2-5 km	208	(59.1)
	>5 km	111	(31.5)
Source of information	Media	216	(61.4)
	Government	135	(38.4)
	Health provider	1	(0.3)
Stress of COVID-19	Normal	28	(8.0)
	Mild	233	(66.2)
	Moderate	80	(22.7)
	Severe	11	(3.1)
Stress of volcanic eruption	Mild	67	(19.0)
	Moderate	281	(98.9)
	Severe	4	(1.1)

Age is categorized according to the Health Ministry of the Republic of Indonesia into early adulthood (26-35 years) and late adulthood (36-45 years). Table 1 shows that the number of male and female respondents is balanced (50.0%). The majority of respondents are in the early adult category (63.4%), graduated from senior high school (52%), have income ≤ IDR 2,500,000 (61.4%), have a distance to Mount Merapi 5-15 km (97.2%), has health insurance from the government (59.1 %), have no experience in participating in disaster training (64.8%), distance to health facilities 2-5 km (59.1%), get information from the media (61.4%). Most respondents felt the stress level experienced by volcanic eruptions was greater than facing the COVID-19 pandemic (moderate 98.9% > mild 66.2%).

Table 2. Sociodemographic Characteristics of Respondents Based on Stress Levels (N=352)

Variable	Total F (%)	Stress Levels During the COVID-19 Pandemic		Stress in Dealing with Volcanic Eruptions		$p^{\dagger}$
		p	r	p	r	
Gender						
Men	176 (50.0)	**0.017**†	-	0.512†	-	**<0.001**
Women	176 (50.0)					
Age (years)						
Early adulthood	223 (63.4)	0.306*	0.107	0.620*	-0.067	**<0.001**
Late adulthood	129 36.6)					0.057

	n (%)					
Education						
Elementary	45 (12.8)	**0.027***	**-0.185**	0.389*	-0.099	0.272
JHS	98 (27.8)					**0.001**
SHS	183 (60.0)					**0.007**
University	26 (4.4)					0.177
Monthly income						
≤ IDR 2,500,000	216 (61.4)	**<0.001***	**-0.508**	0.088*	-0.227	**0.006**
> IDR 2,500,000	136 (38.6)					**<0.001**
Distance of house to top of Mount Merapi (km)						
<5	2 (0.6)	**0.036***	**0.615**	0.061*	0.532	-
5-15	342 (97.2)					**<0.001**
>15	8 (2.2)					0.673
Health insurance						
NHI	208 (59.1)	0.708*	0.037	0.658*	0.059	**<0.001**
Private insurance	14 (4.0)					0.872
Combination	4 (1.1)					0.248
No	126 (35.8)					0.096
Experience of disaster training						
Yes	124 (35.2)	0.820*	-0.024	**0.033***	**-0.286**	0.182
No	228 (64.8)					**<0.001**
Distence of house to health facilities (km)						
<2 km	33 (9.4)	0.645*	0.044	0.803*	0.031	0.310
2-5 km	208 (59.1)					**0.002**
>5 km	111 (31.5)					**<0.001**
Source of information						
Media	216 (61.3)	0.722†	-	0.481†	-	**<0.001**
Government	136 (38.7)					**0.001**

JHS=junior high school; NHI=national health insurance; SHS=senior high school; †Chi-square test; *Kendall Tau test

Table 2 shows that both women (50.2%) and men (49.8%) are in the mild stress category during the COVID-19 pandemic, with a significant relationship (p.017). Education (p.027, r-.185) and income (p<.001, r-.508) are significantly related to stress levels during the COVID-19 pandemic, with a negative relationship. The lower the level of education and income, the higher the stress level. Distance from home is also significantly related to the stress level of the COVID-19 pandemic; the closer to the peak, the higher the stress level (p.036, r.615). Stress levels during the COVID-19 pandemic were not significantly related to insurance (p.708), disaster training experience (p.820), distance from home to health facilities (p.645), and sources of

information (p.722). The experience of participating in disaster training is a factor significantly related to the stress level facing a volcanic eruption (p.033, r-.286). While other factors were not significantly associated with stress in dealing with volcanic eruptions, namely gender (p.512), age (p.620), education (p.389), income (p.088), distance from house to Mount Merapi (p.061), insurance participation (p.658), distance between home and health facility (p.803), and sources of information (p.481).

There is a difference between stress levels during the COVID-19 pandemic and stress during volcanic eruptions for men (p<.001) and women (p<.001). There was a difference between stress levels during the COVID-19 pandemic and stress during early adulthood (p<.001) during early adulthood (p.057). Elementary and university education did not differ in stress levels during the COVID-19 pandemic and stress during volcanic eruptions (p.272 and p.177). Different things can be seen in junior and senior high school education, where both show different stress levels during the COVID-19 pandemic and stress during volcanic eruptions with p<.001 and p.007. A person's income, whether ≤ IDR 2,500,000 (p.006) or >IDR 2,500,000 (p<.001), shows a difference in stress levels during the COVID-19 pandemic and dealing with volcanic eruptions. Houses with a distance of 5-15 km from the top of the volcano show a different level of stress during the COVID-19 pandemic and the stress of dealing with a volcanic eruption (p<.001), while a distance >15 km shows no difference (p.673).

There were differences in the stress levels of the COVID-19 pandemic and volcanic eruption stress among respondents who received government insurance (p<.001). In contrast, private insurance (p.872), combination (p.248), and no insurance (p.096) showed no difference in stress levels. Respondents with experience in disaster training had no difference between COVID-19 pandemic stress and volcanic eruption stress (p.182). In contrast, respondents who had never attended showed a significant difference (p<.001). The farther the distance between the house and the health facility, the results show that there is a difference between the stress of the COVID-19 pandemic and the stress of a volcanic eruption with details of 2-5 km (p.002 and >5 km (p<.001). Sources of information from both the media and the government show that there is a difference between pandemic COVID-19 stress and volcanic eruption stress with p<.001 and p.001.

DISCUSSION

The results showed that most respondents experienced stress during the COVID-19 pandemic and faced volcanic eruptions with varying degrees of variation. The results following the study review indicated that there were psychological disorders during the COVID-19 pandemic, one of which was stress[7], as well as an online survey study with various versions of the Perceived Stress Scale-10 instrument items (German, Italian and French) showing stress is the primary psychological impact due to COVID-19[15]. Meanwhile, regarding the stress of dealing with volcanic eruptions, several countries such as Iceland[4], Japan[5], and the Democratic Republic of the Congo[6] show that people with direct experience of a volcanic eruption experience stress compared to those who don't. Double disaster conditions can add stressors to mental health, according to research in the Philippines showing that stress and anxiety increase in female students during COVID-19 and typhoon disasters[11], in contrast to this study on the double disaster of COVID-19 with volcanic eruptions. Similar research on the Mount Merapi eruption disaster during the COVID-19 pandemic

showed the mild stress category with the most results[12], unlike previous studies that examined post-traumatic stress disorder experienced by people after the eruption in 2010, while this research was being conducted during a moderate eruption of Mount Merapi.

The results show several factors related to stress during the COVID-19 pandemic: gender, education, income and distance between home and the volcano. The study results have the same findings that gender is related to stress during the COVID-19 pandemic. There are differences in control environments by gender. Women are more susceptible to repeated exposure to stress than men[16]. Unlike this study, which only looked at the relationship, previous studies found that women experience higher levels of stress than men. Furthermore, the level of education is positively related to knowledge; Knowledge affects stress. In line with previous email survey research, learning about COVID-19 is associated with the psychological pressure of students living in quarantine[17].

The results of this research align with research in China that income is significantly negatively related to stress during the COVID-19 pandemic[18]. The pandemic has consequences in the economic sphere; The financial crisis can alter a person's mental state[19]. Low socioeconomic status is associated with a high probability of being infected with COVID-19, so high mental stress results in stress and other mental disorders. Additionally, the closer the house is to the summit of Mount Merapi, the further the location will be from the city centre and public services, so access to COVID-19 policies, information, and services will be even further away. This condition can become a particular stressor for people, thus increasing the level of stress when facing a pandemic. The research results are in line with studies in rural communities in China that affirm that COVID-19 is related to the mental health of people there[20]. Another survey of professional workers shows that COVID-19 increases the workload and stress of frontline community staff in rural areas[21].

Results show no relationship between health insurance and stress during the COVID-19 pandemic. This finding differs from previous research in the United States that found that participation in health insurance is negatively related to stress events[22]. Previous research was conducted before the COVID-19 pandemic; However, this research was carried out during a pandemic based on the applicable law that explains that all costs of managing and treating a disease outbreak are the responsibility of the State[23]. According to this regulation, a person affected by COVID-19 does not need to pay for therapy and treatment, so everyone receives the same treatment regardless of insurance. This condition is the possibility that health insurance participation is not significantly related to stress during the COVID-19 pandemic.

The research was conducted when Mount Merapi was experiencing an eruption between May and July 2022. The explosions occurred with recurrent frequency with varying intensities from mild to moderate. The results showed that only the experience of participating in disaster training was related to the stress of dealing with volcanic eruptions. Communities that have participated in disaster training will have more excellent knowledge and skills to use when natural disasters occur, so they are expected to be better prepared when facing disasters. Previous studies have shown that people unprepared for volcanic eruptions will experience more significant stress[24].

Furthermore, the survey by Gissurardóttir et al.[4] also showed contrary results showing a relationship between gender, age and educational stress with the stress of facing a rash. The previous studies were conducted 6 to 9 months after the explosion, as opposed to those carried out during the eruption. While most of the independent variables were statistically unrelated to the stress of facing a volcanic eruption, respondents' responses indicated that everyone experienced mild to severe stress. According to previous research, it was stated that disaster victims would express feelings of panic, fear, stress and anxiety as an emotional response to the disaster[25].

Comparative test results for several variables show differences in stress levels during a pandemic and when dealing with volcanic eruptions. The higher stress levels faced by volcanic eruptions compared to those from COVID-19 may be because the pandemic lasted more than a year. Aknin et al.[26] stated that the first year of COVID-19 was a challenging year and caused mental health problems because they had to adapt to many circumstances. Additionally, at the time of the investigation, the vaccines were being administered to treat COVID-19. According to previous research, the discovery and administration of the COVID-19 vaccine improves mental health[27]. The high-stress level when dealing with volcanic eruptions may be due to the close relationship between the community and the mountain. Warsini et al.[28] stated that the characteristics of the community are very close to Mount Merapi. The community has a unique bond with the mountain and considers the volcanoes their identity, a place to live and socialize, and a means of life.

Double disasters have been proven to increase societal stress; Van Loey et al.[29] examined subjects who experienced two fire disasters, and Papanikolaou et al.[30] studied victims of wildfire and earthquake disasters. The high-stress level during the pandemic and the absence of an average stress level when dealing with a volcanic eruption deserve special attention. What's more, there are several respondents in the severe stress category. This research provides primary data for policymakers or health workers to provide interventions to communities in specific areas. The focus of treatment is expected to be comprehensive in terms of physical and mental health. The community needs to be given health promotion about COVID-19 and the readiness of the evacuation sites built by the government according to the COVID-19 protocol. The district also needs to be given understanding and trained if a major eruption occurs so that evacuation is required to an evacuation location; the community will be better prepared.

Limitations

This research provides an overview of how stress affects people experiencing volcanic eruptions during a pandemic of infectious disease and related factors. The study conducted in person, not online, can provide the advantage of researchers seeing the responses and reactions of the respondents immediately. Direct interaction allows respondents to ask if there are items in the questionnaire that they think are unclear. A large number of respondents, even though within a limited time, can also reduce bias. In addition to these advantages, there are several weaknesses in the study, including using a self-report questionnaire where there is a risk of causing validity problems; respondents may be able to display exaggerated circumstances so that their condition looks more severe or vice versa. Another area for improvement is that researchers only analyze the differences between the two types of stress in terms of the independent variables without going further about which stress has more impact; the

researchers also don't do multivariate testing. This research on stress was carried out in conditions of the double pandemic, infectious diseases and volcanic eruptions so that the possibility of generalizability to other types of disasters is not possible; this is another weakness in the research.

CONCLUSION

The results showed that the majority of respondents experienced stress in the category of mild stress during the COVID-19 pandemic and moderate during volcanic eruptions. Gender, education, income, and the distance between the house and the peak of Merapi are factors related to stress during the COVID-19 pandemic. At the same time, the experience of participating in disaster training is the only factor associated with stress in dealing with eruptions. There is a difference between stress during the COVID-19 pandemic and stress in dealing with volcanic eruptions in the variables of gender, age of early adulthood, junior and senior high school education, income, house within 5-15 km from the peak of Merapi, participation in government insurance, not having experience of disaster training, distance to health facilities, and sources of information. Research data can be used to develop specific interventions to reduce stress in double-disaster areas. Training on volcanic eruption disasters also needs to be carried out in the community, added with special conditions during a pandemic.

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