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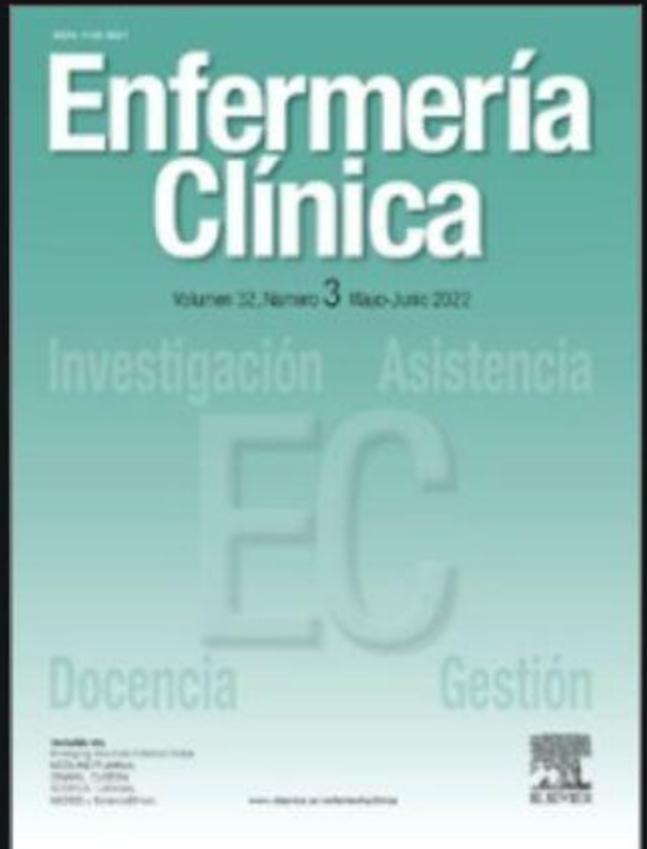
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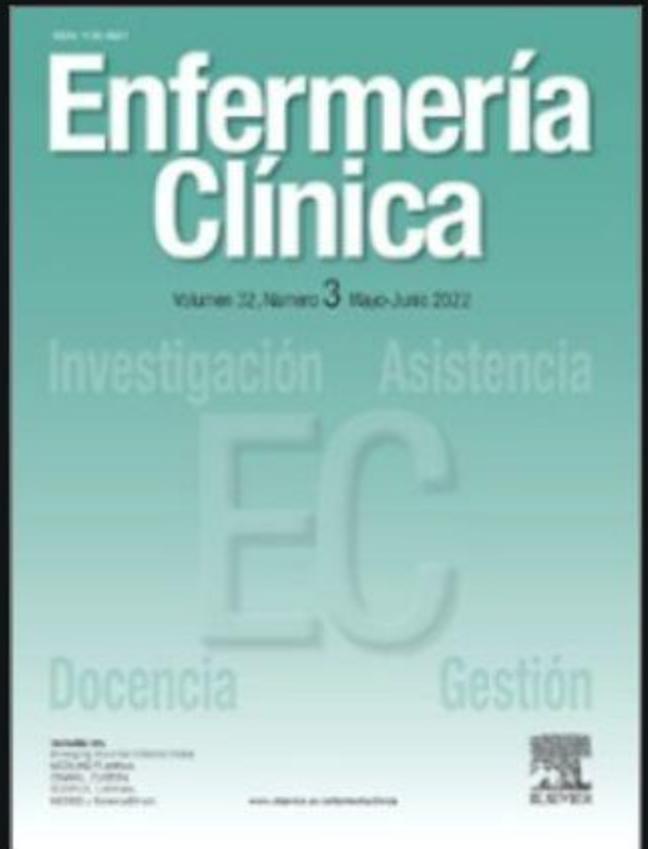
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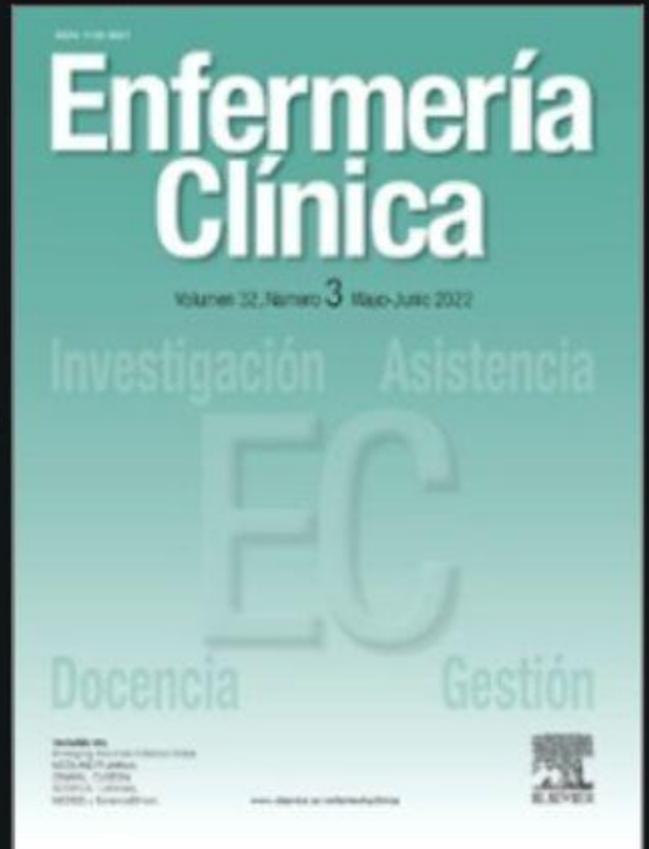


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Analysis of adaptation response of victims Sinabung mountain eruption post-traumatic stress disorder

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Abstract The purpose of this study was to analyze the adaptation response after the eruption of Mount Sinabung in Gurukinayan Village, Karo District. This research is qualitative with an explorative phenomenological approach. Data collection was carried out through observation and in-depth interviews with key informants who were the victims of the Mount Sinabung eruption. The analysis was conducted using content analysis description and life history with 6 participants. The adaptation response results obtained from the community were maladaptive (staying/surviving in the eruption site). The impacts of this eruption are physical/health impacts (cough, shortness, flu and fever), psychological impacts (trauma, anxiety and panic), social/economic impacts (crop failure and job loss), and infrastructure impacts (damaged houses, damaged roads and clean water crisis). Post-eruption adaptation strategies are from the aspects of health (medical treatment, traditional medicine mix), social/economic aspects (carrying out community activities, cultivating land and expecting food and land assistance from donors), infrastructure aspects (building huts, repairing houses, clean water treatment, and expecting operational assistance from the government). It is recommended that in handling post-eruption of Mount Sinabung, the government or village apparatus establish a post-disaster recovery program and decision making (stakeholders) in making policies or decisions related to Eruption Disasters handling.

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Introduction

Mount Sinabung is a volcano in Karo District, North Sumatra Indonesia. The height of this mountain is 2460 m. This volcano has never been recorded erupting since 1600 but was suddenly active again by erupting in 2010.¹ The last eruption of this mountain since September 2013 had spewed volcanic ash and reached 7–8 km altitude. It spread far away then reach the city of Medan which is located about 80 km from the location of the eruption and even to several other districts in North Sumatra. However, the eruption of Mount Sinabung in Karo District, North Sumatra is still ongoing.²

After the natural disaster of Mount Sinabung, many residents' activities have been hampered, one of them is the lack of clean water, food fulfillment, and the work transition that has changed into casual daily labor, and there is no business capital that makes fear of farming.

The trauma and fear experienced by the residents of Gurukinayan Village made it difficult for them to sleep at night, so that the residents took turns to guard, while each family was ready with clothes in a sack so that they could evacuate at any time if necessary. The living conditions are very heartbreaking, especially in meeting their daily needs and for Gurukinayan residents' future, they choose to survive in every kind of conditions. Their fighting spirit is certainly high because naturally humans must be able to defend themselves for life.

However, this area remains as a residential and densely populated area. They try to make adjustments after the natural disasters so they can survive. Adaptation that has been done by the community aims to make them able to adapt adaptively again. From the explanation above it is crucial to conduct a study (analysis) on the adaptation level of Sinabung eruption victim who experience post-traumatic stress disorder (PTSD) in Gurukinayan Village, Karo District.

Methods

The research design used in this study is a qualitative study with an exploratory phenomenology approach. The samples in this study were 6 informants, where data collection was carried out through participant observation and in-depth interviews with key informants who were the victims Mount Sinabung eruption.

This study was approved by the North Sumatra University Research Ethics Committee. Data analysis in this study uses the steps of the Colaizzi analysis and the triangulated³ was also conducted with other research related to the form of disaster adaptation, differences and similarities between the study areas (Gurukinayan Village, Karo District) with other regions.

Results

Based on the results of the analysis from the interviews, 3 themes were obtained: (1) the impact of eruption, (2) adaptation response, (3) post-eruption adaptation form/strategy, 9 sub-themes and 25 categories. Theme 1 consists of 4 sub-themes and 12 categories, theme 2 consists of 1 sub-theme

and 1 category, theme 3 consists of 4 sub-themes and 11 categories (Table 1).

Discussion

The impact of eruption

Based on the physical/health impact, participants, who are the victims of the Sinabung eruption, stated that there were various complaints experienced because of the eruption namely cough, suffocation, flu and fever. These health problems can be caused by volcanic ash acute exposure from short term (in few days) and long term (up to several months).

The symptoms of acute breathing that are often reported by the community after the mountain eruption are irritation of mucous membranes with sneezing complaints, runny nose, irritation and sore throat (sometimes accompanied by dry cough), phlegm coughing, wheezing, shortness of breath, and irritation in the respiratory tract. Volcanic ash that is scattered in the air and carried by the wind to other areas within radius of tens or even hundreds of kilometers is usually very small in size.

According to The International Volcanic Health Hazard Network, in general, volcanic ash causes health problems especially lungs, skin and eyes irritation. As revealed by Pulmonologist, Dr. Ceva Wicaksono Pitoyo, SpPD, KP FINASIM, that roughly, volcanic ash is like cement ash (small and fine rock) that is thrown upwards. Some chemical composition produced by the eruption, such as carbon dioxide (CO₂), sulfur oxide (SO₂), hydrogen and helium (He), at certain concentrations cause headaches, dizziness, diarrhea, bronchitis (respiratory tract inflammation).

Based on the psychological impact, participants expressed their trauma and fear during the eruption of Mt. Sinabung. The residents even experienced anxiety because until now the eruption continued to occur so that when the eruption happens, they panicked and ran with the clothes they had prepared in the sack. In this study context, Gurukinayan villagers interacted with the environment in encountering the eruptions. They repeatedly "encounter eruption". As the result, they experienced trauma. Psychological reaction that arise from the community right after the disaster occur is generally a shock, which then develops into a psychological appreciation that is different from one another.⁴

In the scheme of Schneiderman,⁵ when perceiving excitability beyond the tolerance threshold, it causes stress. To reduce or eliminate stress, they make adjustments to their behavior (coping behavior). Adjustment to the environment is often called the process of adaptation. The environment changes due to the risk and threat of disaster have a negative impact on humans so that it is considered as a vulnerable area. Ahmed⁶ revealed that it did not make intelligent human being stop their activities. Humans are considered can manage adverse effects by reducing it through perception and anticipation.⁷

Based on the social/economic impact, the participants revealed that the plantations they manage were all destroyed due to dust rain (eruption) and resulted in

Table 1 Matrix of thematic.

Theme	Sub-theme	Categories	
The impact of eruption	Physical/health impact	Cough complaints	
		Suffocation complaints	
	Psychological impact	Flu complaints	
		Fever complaints	
Social/economic impact	Infrastructure impact	Fear/trauma	
		Anxiety	
	Social/economy aspect	Panic	
		Crop failure	
Adaptation response Post-eruption adaptation strategy	Maladaptive Health aspect	Work transition	
		Damaged houses	
	Psychology aspect	Damaged road	
		Lack of clean water	
	Social/economy aspect	Survive/stay in eruption location (red zone)	
		Medical treatment	
	Infrastructure aspect	Traditional medicine mix	
		No medical treatment	
			Full spirit
			Motivation
		Society activities	
		Land tillage	
		Expecting food and land assistance	
		Repair houses and land	
		Build a hut	
		Water maintenance	
		Expecting operational assistance	

141 crop failure, so that during the eruption they temporarily
142 switched to work as casual daily laborers.

143 The social/economic impact has a significant influence
144 on the community survival, especially farmers whose entire
145 life is at stake on agricultural field as the main livelihood.
146 When the Sinabung disaster occurred, there were a number
147 of major obstacles faced by farmers, namely damage land
148 condition which cannot produce anything. It affected house-
149 hold income and business institutions did not function. Even
150 though erupted agricultural land would be far more fertile,
151 but it requires a relatively long time.

152 The development up to these days, several social groups
153 that have been formed previously such as farmer groups have
154 not been fully well-conducted due to post-disaster obsta-
155 cles; such as unrecovery soil conditions and lack of capital
156 to buy new plant seeds, because of the broken agricultural
157 condition land. But over time the agricultural land condi-
158 tion can be reused and most of the community go back
159 to their main activities in agriculture. Some of them keep
160 doing their side job which is trading/selling to increase their
161 income.

162 Based on the infrastructure impact, participants revealed
163 a lot of damage caused by volcanic dust, one of them was
164 the damaged house roof since it was unable to support the
165 thickness of the dust. The road became damaged, slippery
166 and full of rocks, and the water color changed which makes it
167 difficult for residents to obtain clean water. Natural disasters
168 that come and go naturally led to huge material losses, such
169 as property loss and infrastructure malfunction.

170 The availability of agricultural land greatly affects the
171 livelihood systems in the village of Gurukinayan. It led the

172 communities to encounter many obstacles in meeting their
173 daily needs and causes a change in their livelihood strategies
174 because natural resources, which are usually the corners
175 of their lives, became damaged or lost as the result of the
176 disaster. Not to mention the damage or loss of property own-
177 ership assets and community houses. Volcanic ash can also
178 cause water contamination, clogged waterways, and devas-
179 tate the water supply. High ash concentration and thickness
180 can also cause death in plants. Likewise, the supply of clean
181 water for agriculture becomes polluted, thus the risk of crop
182 failure is even greater.

183 Adaptation response

184 This theme consists of one sub-theme, namely: (1)
185 Adaptation response: Maladaptive. Maladaptive adaptation
186 response in this case is that the participants remain/survive
187 in the eruption site (red zone). Participants expressed that
188 there was no desire to relocate their homes, preferring to
189 stay in the eruption location even though the eruption keep
190 continuing to happen till this day. Adaptation in the context
191 of disasters is often associated with human capacity to sur-
192 vive in encountering danger. Humans with high capacities
193 are considered not susceptible, whereas humans with low
194 capacities are considered susceptible.

195 Paul⁸ defines vulnerability as exposure to all possible
196 pressures and difficulties that will be faced by the popu-
197 lation or community. Changes in livelihoods that occur after
198 the eruption encourage the farmers in Gurukinayan to have a
199 strategy or ability to survive when conditions are vulnerable.

200 The residents never had a desire to move from Gurukinayan Village, they already feel comfortable in Gurukinayan
201 even though Gurukinayan has been declared as disaster-prone area, and currently Gurukinayan belongs to the red
202 zone area (disaster-prone area) and should not be occupied
203 for the next few years. The community also knew that their
204 village was included in the red zone area, however the com-
205 munity still chose to stay because of their deep love for
206 their village, since Gurukinayan is the place where they were
207 born, grow up, live and work.

208 This fosters a deep conviction not to leave Gurukinayan Village, whatever had happened the community is
209 demanded not to drag on in facing disasters but arise from
210 difficult circumstances and then return to their respective
211 functions in community life. Besides, the cultural attach-
212 ment that exists in Gurukinayan Village is very strong and
213 close which makes people love their village.

214 This is proven by their unwillingness to leave the Gurukinayan Village because they have occupied the village for
215 generations. The community even refused the government's
216 invitation to participate in the house relocation program.
217 The condition of houses in the Gurukinayan Village after the
218 eruption was not 100% damaged but needs to be repaired and
219 it still did not dampen the residents' intention to remain in
220 the Gurukinayan Village. The thing that keeps the commu-
221 nity members alive certainly cannot be separated from the
222 participation of various parties in providing social support
223 provided to the citizens of the Gurukinayan community.

224 More precisely resilience is one's ability to survive, rise,
225 and adjust to difficult conditions.⁹ Individuals who have
226 resilience are able to quickly return to the condition before
227 the trauma, immune to various negative life events, and are
228 able to adapt to extreme stress and misery.¹⁰

233 Post-eruption form/strategy

234 Based on health aspect, the participants stated that they
235 went to the healthcare service to have medical treatment
236 when they experience health nuisance such as cough, breath
237 shortness, flu and fever but some of them do their own effort
238 to make traditional medicine, and some of them let the nu-
239 sance cured by itself without having any medical treatment.

240 Volcanic ash cause by Mount Sinabung eruption certainly
241 gives impacts toward the health especially in the respiratory
242 tract. Many of the residents who live near the disaster area
243 are easy to experience breath shortness. However, some res-
244 idents who are aware of the importance of health go to the
245 health center for treatment. But not few are also only for-
246 mulating traditional medicines such as betel stew to cope
247 with breath shortness and cough. Symptoms of acute breath-
248 ing that are often reported by the community after the
249 eruption are irritation of mucous membranes with sneezing,
250 runny nose, irritation and sore throat (sometimes accom-
251 panied by dry cough), phlegm coughing, wheezing, breath
252 shortness, and irritation in the respiratory tract, but these
253 complaints are also sometimes regarded by residents as only
254 minor complaints that are considered normal and assume it
255 will heal by itself so there is no need to come to the health
256 service for treatment.

257 Based on the psychological aspect, participants
258 expressed many losses experienced due to eruptions.

259 This makes residents experience sorrow, but they still try
260 to keep the spirit despite of many impacts experienced.
261 This high enthusiasm makes citizens become motivated to
262 maintain their survival by making improvements to their
263 land and residence.

264 People experience trauma, confusion and anxiety about
265 where they will live. But the citizens realize that this disas-
266 ter is from God, so that what can be done is only surrender
267 to God Almighty. People are not desperate; they realize this
268 incident as a trial, and they did not experience it them-
269 selves.

270 The Sinabung eruption resulted in damage of houses and
271 land and some residents had to lose their homes due to heavy
272 damage since it was unfit for habitation. This makes people
273 very sad, confused, and anxious because the eruption con-
274 tinues. However, this did not discourage the community from
275 staying in Gurukinayan Village. Their fighting spirit makes
276 citizens survive and do not want to move anywhere. In addi-
277 tion, motivation from oneself to continue living after the
278 eruption is a strong reason that enables them to rise from
279 the deterioration that has occurred.

280 Based on the social/economic aspects, participants
281 expressed a very strong community engagement and social
282 interaction as community activities that carried out in the
283 village of Gurukinayan, such as prayer meeting activities,
284 social gathering and community service. Some participants
285 also revealed that now they are starting to work on their
286 land again, and participants also said that they often get
287 help during eruption in the form of food and other needs,
288 thus that residents always expect help from relevant parties.

289 The social conditions identified are related to the
290 attachment and social interaction of individuals. "Strong"
291 engagement and social interaction is often used as a reason
292 for someone to choose a particular form of flood adaptation.
293 For example, when someone has a relative not far from the
294 location of his residence, there is a tendency to stay in his
295 location even though it is prone to disaster.¹¹

296 In this study, it was identified that the social attach-
297 ment of the majority of the population was relatively strong.
298 Although sometimes there are no relatives in the area, but
299 other social engagement like neighbor's relation are rela-
300 tively strong.

301 The economic conditions are focused on the level of
302 income and welfare of a person. The thing measured is, "is
303 it possible for someone to buy another residence outside
304 the current location". Economic conditions will also illus-
305 trate the ability to reconstruct or modify homes.¹² To restore
306 economic conditions from crises, some family members can
307 make different livelihoods where this method can change
308 temporally and spatially, depending on economic conditions,
309 resources and environmental conditions.¹³

310 Based on the infrastructure aspect, participants revealed
311 that they were trying to repair infrastructure such as repair-
312 ing damaged houses and land, and some were rebuilding
313 their damaged houses by building a hut. In order to get
314 clean water several participants participated in water fil-
315 tration using gravel and fibers, and the residents have also
316 received operational assistance for infrastructure improve-
317 ments such as zinc, road repairs, clean water tanks and
318 heavy equipment.

319 The condition of the residence of the Gurukinayan Village
320 community was quite damaged and in fact, the condition

321 was unfit for habitation because it was covered by volcanic
322 ash. However, the community tried to repair the damage
323 and some even built a hut so that they could survive. The
324 availability of water before and after the eruption of Mount
325 Sinabung is quite sufficient to meet the basic needs of the
326 local community. But since the water pipes were damaged
327 due to the disaster, their availability is limited. Currently,
328 the community continues to strive to meet the needs of
329 clean water through a filtering process.

330 Conflict of interests

331 The authors declare no conflict of interest.

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