

Conference Paper

Comparing Men's and Women's Psychological Preparedness in Cangkringan for Mount Merapi Volcanic Eruptions

Ariela S.C. Sanger and Nicolas Indra Nurpatría

Faculty of Psychology, Atma Jaya Catholic University, Jakarta, Indonesia

Abstract

Mount Merapi is the most active and dangerous volcano in Indonesia with an eruption cycle of approximately five years. Eruptions are unpredictable, causing people who live around the mountain to be prepared for all outcomes. For example, the eruption in 2010 was particularly devastating and caused loss of lives, livestock, and homes, not only due to the eruption itself but also to people panicking during the evacuation process. Such panic could be reduced by ensuring that residents are psychologically prepared for future eruptions through enabling effective responses to natural disasters which have limited psychological impact and that prevent deaths while fostering resilience.

The aim of this research was to determine the differences in psychological preparedness between men and women who live in Cangkringan, Sleman to face future Mount Merapi volcanic eruptions. Cangkringan was chosen because it experienced the most deaths during the 2010 volcanic eruption and because of its high potential for eruption exposure. Prior research has shown that gender is the only demographic variable that significantly affects psychological preparedness. Thus, the *Kesiapsiagaan Psikologis Merapi (KPM)* questionnaire was administered to 47 female participants and 43 male participants, and the results were statistically analyzed by using independent sample T-tests to compare psychological preparedness between men and women.

The results showed that psychological preparedness for Mount Merapi volcanic eruptions among men and women in Cangkringan differ, which aligned with previous research. One contributing factor found was the difference in gender roles during times of disaster that were extensions of everyday gender roles. In their everyday lives, men's roles mostly worked, either as farmers, coolies, employees, and so on. Meanwhile, women's roles were related to household jobs, such as taking care of children and other family members, cooking, and so on. This difference caused different preparation, information, as well as a response while disaster between men and women.

Keywords: psychological preparedness for natural disaster, gender, Merapi Mountain volcanic eruption

Corresponding Author:
Ariela S.C. Sanger
arielasanger@gmail.com

Received: 21 December 2018
Accepted: 23 January 2019
Published: 28 February 2019

Publishing services provided by
Knowledge E

© Ariela S.C. Sanger and
Nicolas Indra Nurpatría. This
article is distributed under the
terms of the [Creative Commons
Attribution License](#), which
permits unrestricted use and
redistribution provided that the
original author and source are
credited.

Selection and Peer-review under
the responsibility of the 3rd
IMOPH & the 1st YSSOPH
Conference Committee.

1. Introduction

"Merapi has never broken its promise" is a common phrase used by residents of Mount Merapi to express that volcanic eruption occur regularly. This is due to the geographical position of Indonesia, in an area where four tectonic plates meet, namely the Indian,

OPEN ACCESS

Asian Continent, Australian Continent, and Pacific Ocean plates. In the eastern and southern parts of Indonesia, there is a volcanic arc that runs through Sumatera, Java, Sulawesi, and Nusa Tenggara, bordered by old volcanic mountains and lowlands that are partly dominated by swamps [1]. In addition to volcanic eruptions, Indonesia also experiences earthquakes, tsunamis, floods, and landslides, which result in Indonesia being an area of a potential disaster at all times.

Mount Merapi's historical volcanic activity is high [2]. According to the Indonesian Ministry of Geological Energy and Mineral Resources [3], Mount Merapi has erupted over 80 times since the 1600s and is, thus, considered one of the most active and dangerous volcanoes in Indonesia. For example, Mount Sinabung is an active volcano located in Karo, North Sumatra, and compared to Mount Merapi, Mount Sinabung eruptions are small, covering an area of 10 kilometers and dominated by ash and pyroclastic flows that reach 4.5 kilometers. Unlike Mount Sinabung, the Mount Merapi eruption of 2010 covered an area of 17 kilometers with a pyroclastic flow of 15 kilometers. Mount Merapi also issues more material, as much as 150 million cubic meters, compared to Mount Sinabung, which has been shown to issue 2.4 million cubic meters [4].

As one of the most active volcanoes in the world, Mount Merapi has two types of eruptions that occur in intervals of approximately five years [5] and two types of eruption cycles (i.e., short and medium). A short eruption cycle ranges from two to five years, while a medium cycle ranges from five to seven years. For many years, Mount Merapi has been effusive in its eruptions, producing diluted magma with weak pressure that causes lava to melt through cracks in the volcano's body. Unlike prior eruptions, the eruption of 2010 was explosive and released magma in solid and liquid form through high-pressure explosions. This type of eruption can be shocking for local residents and can result in both negative and positive impacts on residents.

For the people around Mount Merapi, the mountain is a source of livelihood, through tourism, the sale of volcanic sand, and the farming of fertile soil. In particular, the tourism sector has a significant impact on the lives of Mount Merapi residents, who would be living at much lower economic levels than they currently do without it [2]. Besides the positive impact of eruptions, people must also deal with the loss of loved ones, livestock, property, and, at times, their jobs [5], which has a major economic impact, especially in terms of livestock loss [2]. The 2010 eruption also affected village infrastructure, and it took more than a year for residents to be able to return to daily activities [2]. Additionally, some residents were relocated to safer areas through government programs, resulting in people having to pay more for daily needs, such as water and food because they do not have access to plant vegetable due to smaller land of theirs and access to the river is difficult, so it is hard to get water. The residents then have to buy instead of getting it easily from their local sources. These negative impacts created trauma among eruption survivors, especially those who experienced the loss of family or homes. In addition to trauma, other mental illnesses increased due to the unfavorable conditions of refugee camps. After two weeks in one of these camps, 27 refugees were referred to Dr. Soerodjo's institution in Magelang due to mental illness caused [6]. Based on brief interviews conducted with eight residents in May 2017, it took approximately two to three years for them to recover from the loss of their village.

People are familiar with the positive and negative consequences of eruptions; however, the 2010 eruption caused significant loss of life compared to the previous 2006 eruption, which caused two deaths [5]. Several factors contributed to the casualties in 2010, such as confusing reports, the dense population around Mount Merapi, the Mount Merapi guard being used as a role model for local residents, and unfamiliarity with local wisdom. Mount Merapi guard, also known as Mbah Maridjan, often being a benchmark of when to evacuate during the eruption by the residents. In 2010, Mbah Maridjan didn't want to be evacuated due to his own decision to dedicate his life as a guard. This decision was being misinterpreted by residents and made them stay at their house even though the government and rescue team said it's dangerous. The residents also unfamiliar with local wisdom, such as a bamboo tree that blew up, or animals that went down the mountain is a warning to such dangerous eruption. In addition, local residents underestimated the danger that was told by the government about the pyroclastic flows that would only reach Disaster Prone Area II. Rurit [7] stated that this type of pyroclastic flow was rare, and during the prior eruption, pyroclastic flew only reached Disaster Prone Area III, which was the area closest to the volcano's summit. People were also panicked during the eruption; they "scattered over" houses and crowded streets [8], which caused casualties and injuries during the evacuation process. For example, a collision between a motorbike and a speeding truck occurred while trying to evacuate residents [9].

The Mount Merapi eruption in 2010 caused 347 deaths [3], creating psychological victims, who were survivors that experienced the trauma as stress or depression, among other mental illnesses. According to Hidayat [11], there were 266 psychological cases caused by loss and lack of physical, psychological, and social conditions, including lack of food, water, healthcare, and educational facilities. In particular, the lack of facilities in refugee camps and not knowing when they could return to their homes or the conditions of their property caused significant psychological distress [10]. However, being fully prepared for a disaster, both emotionally and cognitively, is most likely not possible [11]. When disasters occur, distress symptoms will appear among survivors, and 70–80% of people who experience traumatic disaster events experience symptoms such as fear, panic, grief, sleep disturbance, and nightmares. These are natural responses to abnormal situations and are generally temporary, although 20–30% of people will experience severe mental disorders as a result of a disaster [12]. Therefore, preventive efforts are needed to overcome such responses [12, 13] through psychological preparedness.

1.1. Psychological preparedness for natural disasters and gender roles

Psychological preparation before the disaster is also known as psychological preparedness for natural disasters. Zulch, Morrissey, Reser, and Creed [14] stated that psychological preparedness for natural disasters is a heightened state of awareness, anticipation, and readiness for (1) the uncertainty and emotional arousal caused by expectations of possible threats, (2) one's own psychological response to unfolding threats, and (3) managing the demands of the situation. Being psychologically prepared is the most

effective resilience strategy for coping with natural disasters [15], and it improves physical preparation, effective responses, post-impact stress, and post-disaster recovery [13]. Reser and Morrissey [16] claimed that psychological preparedness helps individuals to think clearly and rationally, reducing the risk of serious injury and death.

The effectiveness of psychological preparedness differs among individuals based on demographic factors, most significantly gender [16–18]. Gender differences are created by a lack of accommodation of needs, which occurred during the Mount Merapi eruption [19], which resulted in more male than female casualties due to pyroclastic waves, traffic accidents, heart attack, and suicide [20]. However, females were more psychologically affected than males, and of 266 cases of psychological disorders, 181 were female and 79 were male, which was attributed to females being considered to be more vulnerable than males [19]. Disorders included trauma, stress, depression, anxiety disorders, pre-morbid mental disorders, psychosomatic disorders, emotional disturbances, and insomnia.

From a cultural perspective, men and women have different roles in everyday tasks as well as when disaster strikes. Women tend to take on domestic roles, such as caring for families, including both children and the elderly, as well as the house itself. Men's roles are public and occur outside of the house; thus, when disaster strikes gender roles affect information dissemination, with men receiving information first due to wider mobility and involvement in community meetings and disaster training. This difference in access to information is recognized, although little has been done to rectify the issue because, when disaster strikes, information still flows from adult males to boys, girls, women, the elderly and children, which Fatimah's [19] found was due to the assumption that men play a more important role in disaster management by providing security and aiding evacuation, communication, and coordination.

Post-disaster, women's tasks are focused on refugee camps, where they run public kitchens, babysit children, take care of the elderly, and administer healthcare. This division between public and domestic roles is normal for residents and governments, limiting information access and opportunities to improve women's capacities during disaster efforts. Some women disagree with these differing gender roles but are not supported by more opportunities to contribute outside of the domestic sphere [19], even though disasters affect both.

During disasters, governments and people focus on evacuation, recovery, and rehabilitation processes [21]. Therefore, this research focuses on preparation before disaster, especially psychological preparedness, which has been referred to in disaster literature for more than 15 years, although with limited scope [14]. To date, no research has been conducted about psychological preparedness for natural disasters in Indonesia; thus, the current research was conducted in Disaster Prone Area III due to it being the closest area to the summit of Mount Merapi and its increased potential exposure to risk, compared to Disaster Prone Areas I and II. Disaster Prone Area III should not include residence; however, despite the high risk and government warnings, the area is densely populated, with Cangkringan having 31,028 residents. The populations of Disaster Prone Areas III and II are spread among five villages: Argomulyo, Wukirsari, Glagaharjo, Kepuharjo, and Umbulharjo. This research examined how genders roles

in the Mount Merapi area influenced psychological preparedness by determining the differences between men's and women's psychological preparedness to face Mount Merapi Mountain volcanic eruptions in Cangkringan.

2. Methods

This study used a quantitative non-experimental method that included a questionnaire to collect data from participants. The questionnaire used was *the Kesiapsiagaan Psikologis Merapi (KPM)*, adapted from the Psychological Preparedness for Disaster Threat Scale (PPDTS) and translated into Indonesian from English. The population of this research was all residents in Disaster Prone Area III, (i.e., Cangkringan and Yogyakarta), totaling 3.668 people divided among three areas: Kepuharjo, Umbulharjo, and Glagaharjo. These areas were chosen based on Slemankab's data [22]. Bartlett, Kotrlik, and Higgins [23] suggested that to take into account, this research ideally had to be conducted among 119 participants with a significance level of 0.05. Data were collected by using non-probability sampling and a convenience method among nine villages: Kaliadem, Petung, Jambu, Kinahrejo, Pangukrejo, Gambretan, Kalitengah Lor, Kalitengah Kidul, and Srunen. Before collecting data, the KPM questionnaire was administrated to residents in Argomulyo and Wukirsari as questionnaires to pilot the process. These results were analyzed by using item discrimination and item homogeneity, validity, and reliability methods, and the 16 of 18 items were finalized for data collection from the study participants. A statistical T-test independent sample was used to determine the differences between men's and women's psychological preparedness due to both groups having normal curves, which caused parametric methods to be used for the process.

3. Results

Below are the results of the KPM questionnaire administered in eight villages: Kaliadem, Petung, Jambu, Kinahrejo, Pangukrejo, Gambretan, Kalitengah Lor, and Kalitengah Kidul to 90 participants (43 females and 47 males; age range: 18–50 years).

TABLE 1: Age and Gender of Participants.

Age	Men	Women	Frequency
18-28	11	7	18
29-39	13	14	27
40-50	19	26	45
Total	43	47	90

As shown in Table 1, the significance of the results was 0.002, which was lower than 0.05, indicating that the null hypothesis was rejected; thus, differences between men's and women's psychological preparedness to face Mount Merapi volcanic eruptions in Cangkringan did exist. To make sure the hypothesis test method was correct, a normality test for all participants was performed.

TABLE 2: Level of Education of Participants.

Level of Education	Men	Women	Frequency
No school	8	13	21
Elementary School	9	12	21
Junior High School	10	17	27
Senior High School	10	2	12
Vocational High School	5	3	8
3-year Diploma	1	0	1
Total	43	47	90

As shown in Table 2, male participants had a significance of 0.433, and female participants had a significance of 0.236, showing that both groups were within normal data curves and could be analyzed using a parametric method.

4. Conclusion

The results of this research of the Mount Merapi area agrees with prior research conducted by Reser and Morrissey [15], Clode [16], and Boylan [17], as well as the hypothesis in this research that stated that there are differences between men's and women's psychological preparedness for a volcanic eruption. However, there are limited explanations of why these differences exist because most of the prior research use quantitative rather than qualitative methods.

Clode [16] argued that gender was the contributing factor, which was supported by Delaine, Pedler, and Robert, who found that women were more likely to be casualties of fire because they did not have the confidence or intent to fight fires, which led to late evacuations. Boylan's [17] research stated that there were several debates about the cause of different psychological results between men and women, while Eriksen, Gill, and Head [16] argued that this difference was due to gender roles. In support of this research, gender role differences were applied in the population of the Mount Merapi area, in daily work, communication, and distribution of household roles.

The results of this research create a benchmark for further research of psychological preparedness for natural disasters in Indonesia because it does not explain gender differences in-depth. Thus, future research should use qualitative methods to determine the details of psychological preparedness for natural disasters among men and women. Quantitatively, it is suggested to increase the number of research participants so that results can be generalized.

Ethical Approval

The KPM questionnaire was administered to residents in Disaster Prone Area III. The ethical approval was given by the government in Jakarta, Sleman, head of the villages, as well as all the participants who agreed to take part in this research.

Competing Interest

Authors declare that there is no competing interest

References

- [1] Suryamihardja, R.D. (2009). Peranan IDS dalam manajemen bencana. *Globe Volume*, 11(1), 73-78.
- [2] Utari, A.R., Putri, F. E., Diantari, H. C., Hadhary, R. G., Qolbi, S. H. (n.d). *Dinamika Perubahan Kehidupan Masyarakat Lereng Merapi Sebelum dan Setelah Erupsi 2010*. Retrieved February 3, 2016 from <http://hmgf.fmipa.ugm.ac.id/>
- [3] Kementerian Energi dan Sumber Daya Mineral Badan Geologi. (2014). *G. Merapi-sejarah letusan*. Retrieved August 27, 2016 from <http://www.vsi.esdm.go.id/index.php/gunungapi/data-dasar-gunungapi/542-g-merapi?start=1>
- [4] Franciska, C. (2014). Vulkanolog: Erupsi Sinabung belum sebesar Merapi. *BBC*. Retrieved July 29, 2017 from http://www.bbc.com/indonesia/majalah/2014/01/140121_sains_gunung_sinabung
- [5] Maarif, S. (2013). *Merapi menyapa kehidupan*. Jakarta: Badan Nasional Penanggulangan Bencana.
- [6] Rusmiyati, C. & Hikmawati, E. (2012). Penanganan Dampak Sosial Psikologis Korban Bencana Merapi. *Informasi*. 17(2), 97-110.
- [7] Rurit, B. (2010). Mengapa Merapi banyak menelan korban pada 2010?. *Tempo*. Retrieved September 12, 2016 from <https://m.tempo.co/read/news/2010/10/27/173287496/mengapa-merapi-banyak-menelan-korban-pada-2010>
- [8] Merapi meletus lagi, warga Kaliurang panik. (2010). *Viva*. Retrieved January 26, 2016 from <http://www.viva.co.id/berita/nasional/186910-merapi-meletus-yogya-panik-dan-listrik-mati/>
- [9] Panik, pengungsi Merapi tewas tertabrak truk. (2010). *Viva*. Retrieved January 26, 2016 from <http://www.viva.co.id/berita/nasional/185824-panik-pengungsi-merapi-tewas-tertabrak-truk/>
- [10] Hidayat, R. (2011). Dampak Kesehatan Mental dan Psikososial Bencana Erupsi Gunung Merapi 2010. *Simposium Gunung Merapi: Kajian Perilaku, Dampak, dan Mitigasi Bencana Akibat Erupsi Merapi 2010*. 143-151.
- [11] Reser, J. & Morrissey, S. (2009). *The crucial role of psychological preparedness for disaster*. Retrieved January 25, 2016 from https://www.psychology.org.au/inpsych/psychological_preparedness/#top
- [12] Ulfah, E. (2013). Intervensi spiritual emotional freedom technique untuk menurunkan gangguan stres pasca trauma erupsi Gunung Merapi. *Journal of Educational, Health and Community Psychology*, 2(1), 38-57.
- [13] Guterman, P.S. (2005). *Psychological preparedness for disaster*. Retrieved March 22, 2016 from http://www.ceep.ca/resources/Guterman2005_Psychological_Preparedness_for_Disaster.pdf
- [14] Zulch H.R., Morrissey S.A., Reser J.P., Creed P. (n.d). *Psychological Preparedness for Natural Disasters*. (n.p).
- [15] Malkina-Pykh, I. G. & Pykh, Y. A. (2013). An Integrated Model of Psychological Preparedness for Threat and Impacts of Climate Change Disasters. *Proceedings of the III International Conference on Disaster Management and Human Health: Reducing Risk, Improving Outcomes*. 121-133.
- [16] Morrissey S. A. & Reser, J. P. (2003). Evaluating the effectiveness of psychological reparedness advice in community cyclone preparedness materials. *The Australian Journal of Emergency Management*, 18(2), 46-61.
- [17] Clode, D. (2010). *Coping with Fire: Psychological Preparedness for Bushfires*. Retrieved November 22, 2016 from https://www.researchgate.net/publication/270275555_Coping_with_fire_Psychological_preparedness_for_bushfires
- [18] Boylan, J.L. (2016). *The Development and Validation of the Bushfire Psychological Preparedness Scale (BPPS)*. Disertasi Pasca Sarjana. Faculty of Psychology University of Western Australia, Australia.
- [19] Fatimah, D. (2008). *Gender dalam Pengelolaan Bencana: Studi Kasus Merapi*. Retrieved February 16, 2016 from https://www.academia.edu/2382085/Gender_dalam_Pengelolaan_Bencana_Merapi
- [20] Kementerian Pemberdayaan Perempuan dan Perlindungan Anak. (2011). *Gender dalam bencana alam dan adaptasi iklim*. Retrieved November 15, 2016 from <http://www.kemenpppa.go.id/lib/uploads/list/c3b33-6.-gender-dalam-bencana-alam-dan-adaptasi-iklim.pdf>
- [21] Ghafur, W.A., Noorkamilah, Gazali, H. (2012). Resilience perempuan dalam bencana alam Merapi: Studi di Kinahrejo Umbulharjo Cangkringan Sleman Yogyakarta. *Welfare, Jurnal Ilmu Kesejahteraan Sosial*. 1(1), 43-68.
- [22] Slemankab. (2011). *Data sebaran penduduk KRB II & III Gunung Merapi*. Retrieved October 11, 2016 from <http://www.slemankab.go.id/1260/data-sebaran-penduduk-krb-iii-ii-gunung-merapi.slm>

- [23] Bartlett, J.E., Kotrlik, J. W., & Higgins, C.C. (2001). Organizational research: Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, 19 (1), 43-50.