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COVID-19 and health behaviors of the vulnerable group in the disaster-prone area:a case study of volcano-prone Merapi, Indonesia

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ABSTRACT As the world's fourth most populous country, Indonesia is predicted to suffer greatly from the pandemic. One of the most vulnerable groups in Indonesia is those living in the disaster-prone areas where access to health services is limited. This study aims to identify whether households in the disaster-prone area were already aware of and have implemented protective health behaviors during the COVID-19 pandemic. The location of the study was at Dongkelsari settlement houses in the Disaster-Prone Area III of Mount Merapi, the most active volcano in Indonesia. Descriptive statistics were used to summarize the quantitative data collected from face-to-face interviews with 142 out of 161 households residing in that area. Our findings suggest that knowledge about disease and prevention is quite high in our sample. More than 90% of the sample were already aware of COVID-19 transmission and understood that washing hands and wearing facemasks can prevent the spread of COVID-19. This high level of awareness is inseparable from the active role of community leaders in Dongkelsari area. However, only less than half of the sample reported practicing safe physical distancing. In conclusion, our study relies on field observation, and this complements the existing evidence by capturing a clearer picture of the COVID-19 awareness among the underrepresented population living in the disaster-prone area of Merapi volcano.

1.Introduction

After the novel Corona Virus Disease 2019 (COVID-19) started in the city of Wuhan at Hubei Province in China, the world has suffered severely from the global pandemic induced by SARS-CoV-2. The pandemic has certainly disrupted economic stability and many aspects of life. With its unprecedented impacts, the world might take more than ten years to recover, both economically and societally. Given the unforeseen and rapid spread of COVID-19, the pandemic has put immense pressure on health systems and left many governments worldwide unprepared, particularly low- and middle-income countries with less resilient health systems.

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Every country should adopt preventive measures to slowdown the spread of COVID-19 and prevent its health systems and economies from becoming collapsed. The success of such measures depends on the adherence of the population. Accordingly, governments need to ensure that the population is well-informed concerning the disease and people strictly follow all the necessary safety measures.[1]

As the fourth most populous country in the world, Indonesia is predicted to suffer greatly from the pandemic, even for a longer time period. However, two years after its first confirmed case on March 2, 2020, the country is currently managing to survive from an economic recession and on its track to recovery. During the pandemic, although the government and health professionals have recommended effective containment measures such as staying at home, physical distancing, frequent handwashing and

wearing facemasks, it remains unknown whether vulnerable groups in the population also engage in preventive health behaviors. One of the most vulnerable groups is those living in the disaster-prone areas with limited access to basic health services. They are still encountering health disparities due to various obstacles with regard to the lack of health care resources, geographic distance, transportation, and lower socioeconomic status.

While existing research has paid attention to preventive behaviors among rural residents, there is limited and even no evidence of the impact of COVID-19 pandemic on changes in health behaviors among households living in the disaster-prone area.[1–3] A clear understanding of whether COVID-19 has influenced the health behaviors among this vulnerable group is important to inform government interventions that are relevant to future situations in such areas. Therefore, the aim of this study is to examine whether households in the disaster-prone areas were aware of and have practiced health preventive measures during the COVID-19 pandemic in Indonesia. This study is particularly relevant as a means to prepare for a future pandemic or health crisis.

To shed light on the research objective, we conducted face-to-face interviews with 142 households living at Dongkelsari settlement houses in the Disaster-Prone Area III of Mount Merapi, the most active volcano in Indonesia. Participants were asked about their basic profile, implementation of preventive health behaviors, community support, healthy lifestyle and general knowledge about COVID-19 transmission. We used descriptive statistics to summarize the quantitative data collected from the participants.

So far, there is an online survey conducted in Indonesia indicating that even though the majority of respondents possessed basic knowledge on COVID-19, they still need further information about symptoms, transmission, prevention and testing.[4] However, this online survey tends to oversample younger individuals and those with higher socioeconomic status. They are more likely to have various sources of information and means to process the knowledge and act on it rather than the average population.[5] In contrast to online surveys, our study relies on field observation and this complements the existing evidence by capturing a clearer picture concerning the COVID-19 awareness among the underrepresented populations living in the disaster-prone areas.

2.Methods

2.1 Study area

Mount Merapi is one of the most active and hazardous volcanoes in Indonesia, where more than 70 eruptions have occurred since 1548.[6] It is situated 30 km north of the city center of Yogyakarta. The latest eruption occurred in 2010, causing damages to more than 2,200 houses.[7] The status of the volcano has been on alert since May 2018, leading to the potential eruption amid the COVID-19 pandemic. The existence of communities residing in the Disaster-Prone Area III of Mount Merapi then becomes vulnerable populations in a distinct danger zone. In this study, we focused on inhabitants of the Dongkelsari settlement houses.

Initially, the Dongkelsari settlement houses were built as temporary shelters for the eruption victims of Mount Merapi after their old houses were destroyed. Dongkelsari is situated in Wukirsari Village, Cangkringan Subdistrict, covering two small villages named Gungan in the northern part and Srodokan in the southern part with an area of 24,690 m2. There are 161 households residing in the settlement houses. There are some public facilities such as green open space, mosque, gazebo-like building, and security kiosk. The majority of Dongkelsari residents work as peasants and cattlemen, while the rest are pensionaries. The nearest public health service is situated around two kilometers from Dongkelsari area with difficult access to get there due to uneven terrain and winding roads.

2.2 Study design and participants

Data were collected from a structured questionnaire with face-to-face interviews between end of August 2020 and early September 2020. Selection of this period was based on the mild situation in Mount Merapi. We conducted door-to-door interviews with 142 respondents aged 16 years

or older from 161 households. The remaining 19 households refused to be interviewed due to various reasons, such as relocation to safer area, health issues, and not having enough time.

Participants were given a brief description of the study and written consent to participate in the study before the start of the questionnaire/interview. They received a token of appreciation in the form of hand soap and detergent upon completing the questionnaire. The study was approved by the Research Community Service and Publication Institution as the Institutional Ethical Board in Universitas Muhammadiyah Yogyakarta with the number 031/PEN-LP3M/I/2020.

2.3 Questionnaire and data analysis

The purpose of this study was to determine the impact of COVID-19 on preventive health behaviors. The questionnaire was developed through the role of the experts who understood the topic well. The experts read through the questionnaire and assessed whether the questions already captured the investigated topic effectively. They pretended to fill out the questionnaire and checked whether there were common errors such as confusing and 'double-barreled' questions. Given that the population is around 160 households, we validated the questionnaire through a pilot test. We started with 30 participants, and after some feedback and discussion, we dropped any irrelevant questions.

The participants were asked about their area of settlement, age and gender. Then, we captured self-reported preventive measures with a 4-point Likert scale where '1' indicates "never" and '4' indicates "always". We focused our analysis on three preventive health behaviors as suggested by the government and health experts: physical distancing, hygiene, and wearing facemask. We defined physical distancing by staying at least 1 meter apart from other people in public spaces, while hygiene was defined as using hand sanitizer and frequently washing hands with soap.

In the next part, the questions were related to community support with a series of yes/no question. We asked about self-assessment from participants whether in their community there are: (1) handwashing facilities in the entrance to market, restaurant, store, health center and school, (2) provision of hand sanitizer in in the entrance to market, restaurant, store, health center and school, (3) provision of handwashing barrel in front of houses, (4) restriction of guests visiting from out of town, (5) curfew restrictions, (6) prohibition of guests from out of town to stay, (7) portal closure at night, (8) self-isolation after travelling out of town, (9) mandate to wear facemasks outside the house, (10) prohibition to organize event, and (11) stipulation to self-report to local leaders after travelling out of town.

For questions concerning healthy lifestyle, participants were asked whether there is any household member smoking. If participants responded yes, they were asked whether there is any change in smoking habit with a 4-point Likert scale (1 = no changes, 2 = reduced a little, 3 = reduced greatly, 4 = quit smoking) and how many cigarettes consumed in daily basis after the pandemic. Then, we asked the participants whether smoking makes COVID-19 worse (yes/no). We also asked the participants to rate the eating habits of their family in general whether they ate fruits and vegetables using a 4-point Likert scale (1 = no, 2 = once in a week, 3 = once in a day, 4 = three times in a day) and whether they performed physical exercise for at least 30 minutes per day (1 = no, 2 = once in a week, 3 = three times in a week, 4 = everyday).

Finally, we assessed the knowledge of the participants since one important determinant of the implementation of preventive health behaviors is information.[8] In a pandemic situation, behavioral responses are driven by knowledge on how the virus spreads and which precautionary actions exist.[9] Individuals with greater knowledge are more likely to adhere with restrictions during an outbreak.[10]

There are eight questions on basic knowledge of COVID-19 transmission, prevention and uptake of protective behaviors. The participants were given agree/disagree questions, coded as 0 (disagree) and 1 (agree). Such questions include: (1) knowledge about COVID-19 transmission through droplets, (2) prohibition of buffet style of eating, preventive measures such as (3) frequent handwashing, (4)

Table 1. Preventive health behaviors of study participants in Dongkelsari.

Variable	Frequency (%)	Min	Max	Mean	Std. Dev.
Handwashing with soap	142	1	4	3.92	0.23
Never	1 (0.7)				
Seldom	0 (0.0)				
Sometimes	8 (5.6)				
Always	133 (93.7)				
Using sanitizer	142	1	4	3.36	0.71
Never	4 (2.9)	15			
Seldom	10 (7.0)				
Sometimes	59 (41.5)				
Always	69 (48.6)				
Physical Distancing	142	1	4	3.27	0.68
Never	1 (0.7)				
Seldom	18 (12.7)				
Sometimes	64 (45.1)				
Always	59 (41.6)				
Wearing facemask	142	1	4	3.81	0.47
Never	1 (0.7)				
Seldom	2 (1.4)				
Sometimes	20 (14.1)				
Always	119 (83.8)				

Min-max, minimum-maximum; Std. Dev., standard deviation.

wearing facemask, (5) regular exercises, (6) boost immunity with supplements and vitamins, and (7) knowledge that COVID-19 is likely to transmit from airborne droplets. We summed up the scores for these eight items, of which higher scores represented better knowledge in COVID-19. All the data obtained from the study questionnaire were then compiled and measured using descriptive statistics through SPSS 17.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics contain some basic statistical measures, such as mean, standard deviation (SD), minimum and maximum values, to help us analyze the location and dispersion of the data.

3.Results

From the sample of 142 participants, 66.2% were women and 33.8% men. The average age of participants was 43 years and the most represented category was 35 – 45 years old (59, 41.5%). Based on the study framework, the results were divided into four categories. First, considering the importance of preparedness for responding to the COVID-19 pandemic, the participants were asked to rate their level of intensity for preventive health measures on the Likert scale of 1 to 4.

As seen in Table 1, the following results were obtained: washing hands with soap (X = 3.92), using hand sanitizer (X = 3.36), keeping a suggested distance of 1 meter from other people (X = 3.27) and wearing facemask (X = 3.81). It was found that majority of the participants were more engaged with some preventive behaviors such as washing hands frequently with soap (93.7%) and wearing face masks (83.8%), but less engaged with using hand sanitizer (48.6%) and practicing safe physical distancing (41.6%).

Second, in terms of community support, the participants reported that around 80% were aware of the provision of handwashing facilities and hand sanitizer in public spaces as reported in Table 2. This finding indicates strong community support in maintaining preventive health behaviors of the people outside their house. Moreover, the majority of participants were also aware of stipulation set by the local leader to prevent further spread of COVID-19 ranging from prohibition to organize public events (73%) to a mandate of wearing facemasks (96%). This high awareness is potentially due to a relatively low population density. Any violation to this stipulation will be easily identified by other inhabitants in that area.

Third, concerning the healthy lifestyle, Table 3

Table 2. Community support for preventive health behaviors in Dongkelsari.

Variable	Min	Max	Mean	Std. Dev.
Provision of handwashing facilities	142	1	4	3.92
Market	0	1	0.85	0.36
Restaurant	0	1	0.88	0.33
Store	0	1	0.92	0.27
Health Centre	0	1	0.84	0.37
School	0	1	0.83	0.38
Provision of hand sanitizer	142	1	4	3.81
Market	0	1	0.79	0.41
Restaurant	0	1	0.85	0.36
Store	0	1	0.87	0.34
Health Centre	0	1	0.85	0.36
School	0	1	0.82	0.39
Provision of handwashing barrel	0	1	0.92	0.28
Restriction of guests	0	1	0.94	0.24
Curfew restriction	0	1	0.82	0.38
Prohibition of guests staying	0	1	0.85	0.36
Portal closure at night	0	1	0.90	0.30
Self-isolation from out of town	0	1	0.89	0.32
Mandate to wear facemask	0	1	0.96	0.20
Prohibition to organize event	0	1	0.73	0.44
Self-report to local leader from out of town	0	1	0.86	0.35

Min-max, minimum-maximum; Std. Dev., standard deviation.

Table 3. Healthy lifestyle of study participants in Dongkelsari.

Variable	Obs.	Min	Max	Mean	Std. Dev.
Smoking family member(s)	142	0	1	0.51	0.50
Number of cigarettes	46	1	30	7.89	6.19
Change in smoking habit	72	1	4	1.74	0.84
No changes	36				
Reduced a little	23				
Reduced greatly	11				
Quit smoking	2				
Smoking makes COVID-19 worse	142	0	1	0.58	0.49
Has a smoking family member	72	0	1	0.53	0.50
No smoking family member	70	0	1	0.64	0.48
Eating fruits and vegetables everyday	142	1	4	2.77	0.78
Daily physical exercise	142	1	4	2.76	0.93

Min-max, minimum-maximum; Std. Dev., standard deviation.

shows that half of our sample has a smoking family member. The average of reported consumption is 8 cigarettes per day. Our sample reported that half of those with smoking family member do not change their smoking habits. It seems that the COVID-19 pandemic does not have any impact on smoking habits. While 47% reported reduction in consumption of cigarette and 3% quit smoking, we cannot conclude that this behavior is driven by the pandemic. This is supported by mixed responses of whether smoking makes COVID-19 worse. Only 53% of participants with a smoking family member believed that smoking could increase the risk from COVID-19. There is a low correlation between reduced or quitting smoking and the belief that smoking could make COVID-19 worse for those with

Table 4. COVID-19 knowledge of study participants in Dongkelsari.

Variable	Min	Max	Mean	Std. Dev.
COVID-19 transmission through droplet	0	1	0.96	0.20
Prohibition of buffet	0	1	0.76	0.43
Handwashing with soap	0	1	0.96	0.20
Wearing facemask outside the house	0	1	0.99	0.08
Regular physical exercise	0	1	0.88	0.33
Boost immunity with supplements and vitamins	0	1	0.75	0.43
Likely COVID-19 transmission from airborne droplets	0	1	0.80	0.40
Total score	4	7	6.10	0.85

Min-max, minimum-maximum; Std. Dev., standard deviation.

a smoking family member (p = 0.03).

Meanwhile, those with non-smoking family member believe more that smoking increases the risk of COVID-19 (64%). For eating habits and physical exercise, it is reported that participants in general have eaten fruits and vegetables regularly (X = 2.77) and routinely practiced exercise (X = 2.76).

Finally, in terms of basic knowledge (Table 4), 96% of participants indicated that they had knowledge that COVID-19 is transmitted through droplets. This contributed to the higher proportion of participants having knowledge of several prevention measures such as handwashing with soap (96%) and wearing facemasks outside their house (99%). The majority of participants were aware that physical exercise is important even if they have washed their hands frequently with soap and worn facemasks (88%). They were also knowledgeable that buffet style of eating is prohibited to prevent COVID-19 spread (76%) and consuming supplements and vitamins is necessary to boost their immune system (75%). They already understood that COVID-19 was less likely transmitted from airborne sources (80%). In terms of total score, the basic knowledge of study participants about COVID-19 was relatively high. It is 6.1 out of 7 on average.

4.Discussion

Our findings add to a recent and growing literature on COVID-19 knowledge and attitudes. A global online survey exposed high compliance to preventive behaviors across countries.[11] The evidence for knowledge on transmission of the disease is widely reported among respondents in some developing countries such as Nigeria and India, but not in Peru.[12–15]

The above mentioned results reveal knowledge about the COVID-19 pandemic and preventive health behaviors among study participants in the disaster-prone area of Merapi volcano. Although the COVID-19 pandemic was not yet advanced in Dongkelsari at the time of data collection, awareness of and basic knowledge on the COVID-19 was already high. These findings were somewhat in contrast to the existing literature where rural residents were less likely to perform protective behaviors during an outbreak.[1,3,16] The majority of participants were already aware of COVID-19 transmission and able to mention preventive health measures. This finding implies that information about COVID-19 has reached the population group living in the disaster-prone area of Merapi volcano.

This finding is inseparable from the importance of community leaders as the respected figures in Dongkelsari area. It was mentioned in the Results section that the compliance of the study participants toward the stipulation set by the community leaders is quite high, ranging from 73% to 96%. Based on the field observations, the community leader in Dongkelsari is quite young, tech savvy and currently works in the COVID-19 taskforce, making the basic information about COVID-19 well-distributed to the inhabitants of Dongkelsari. This is particularly supported by the low population density in that area which makes information delivered more easily. In addition to basic knowledge about COVID-19, community support such as provision of handwashing facilities in public spaces and mandate to wear facemasks outside their house

were found to facilitate participants' compliance in applying such behaviors. On the other hand, study participants seemed to be less engaged in using hand sanitizer and applying safe physical distancing. Thus, compelling people to apply safe physical distancing, for instance, needs to be reinforced. Neglect of this preventive measure by community members may lead to adverse consequences since most cases of COVID-19 in Indonesia have been associated with the lack of physical distancing in public spaces.

To improve compliance with preventive measures such as physical distancing, we recommend the active involvement of social workers. It is because social workers promote preventive efforts through distribution of accurate information from reliable sources.[17] In China, for example, social workers are considered as front liners in the COVID-19 pandemic response. Their duties include mobilizing and coordinating resources in the community, providing volunteer support and identifying the special needs of vulnerable groups.[18] This study then offers suggestions for social workers to help control the spread of COVID-19 in the disaster-prone communities in Indonesia.

Finally, changing health behavior is the most important factor in tackling the pandemic. While our study may have revealed interesting findings that have implications for future research and social-work practice, there are some limitations inherent in the study. Findings from this study represent the knowledge and attitude of a sample of locals from a small community in the disaster-prone area of Mount Merapi. We do not account for views of other locals from different community so that we do not generalize our findings to the larger population. Thus, findings may differ with an institutional setting and a larger sample size. However, this study is still important in that it can be used as a starting point to see a bigger and clearer picture of other disaster-prone areas in Indonesia during the COVID-19 pandemic.

5.Conclusions

The risk to communities with widespread transmission of COVID-19 relies on the virus' characteristics, the severity of the illness, and the available medication to curb the impact of the virus. In the absence of medication during the pandemic, behavioral interventions become the most important strategy based on preventive measures implemented by the citizen. In this study, we explore the knowledge and preventive health behaviors against COVID-19 in Dongkelsari settlement houses which are situated in the disaster-prone area of the active volcano, Mount Merapi.

Our study was conducted via a structured questionnaire with face-to-face interviews. Interestingly, although our concern was those living in the disaster-prone area at the slope of mountain, we found high knowledge exists among the study participants as well as strong community support in the neighborhood. These might contribute to be the driving factor in preventive health behaviors against COVID-19. Our findings imply that the information about COVID-19 was already well-received by those living in the disaster-prone area. However, given that this study was only based on one location, future research should address other locations in the disaster-prone area for external validity of the findings.

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Conflict of interests

There is no conflict of interest in this study.

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