

ORIGINAL ARTICLE

Relationship between disaster awareness and disaster preparedness: online survey of the community in Indonesia

ARIEF HARGONO¹⁻³, KURNIA DWI ARTANTI^{2,3}, ERNI ASTUTIK^{2,3}, PAULUS PUNJUNG WIDODO¹,
ARTI NOVELIA TRISNAWATI¹, DIAZ KUSUMA WARDANI¹ and EVI LIONI²

¹Master Program in Disaster Management, Postgraduate School of Airlangga University, Universitas Airlangga, Surabaya; ²Department of Epidemiology, Biostatistics, Population Studies and Health Promotion, Faculty of Public Health, Universitas Airlangga, Surabaya; ³Disaster Management Research Group, Postgraduate School of Airlangga University, Universitas Airlangga, Surabaya, Indonesia

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Abstract. Indonesia is a country that is classified as prone to disasters because of its territory that has a lot of tectonic activity and is located between the ring of fire. Given the urgency of improving people's preparedness for disasters, studies are needed to provide a comprehensive understanding of the factors associated with disasters. One of which is disaster preparedness, that is influenced by public awareness of disasters. The aim of this study was to analyze the relationship between current awareness level of the community towards disaster and Community preparedness for disaster preparedness efforts in Indonesia. The design of this study was cross-sectional. Data were collected by a self-administered online survey. The study respondents were community that are accessible and were willing to fill out questionnaires voluntarily. The research was conducted in March-October 2021 with the nation as the research location. The size of the sample was 400 respondents obtained from the calculation of estimation in finite population. Respondents with lower current awareness level of the community towards disaster had higher risk 1.49 times to have lower community preparedness for disaster preparedness efforts compared to respondents with higher community preparedness for disaster preparedness efforts (PR=1.49, 95%CI=1.25-1.76, P<0.001). Increasing public awareness about disaster preparedness is very important. The government can work with non-governmental organizations and community leaders to provide understanding and training to the community to deal with disasters.

Introduction

A disaster is an event that disrupts normal conditions and causes suffering that exceeds the capacity of the affected communities (1) Indonesia is geographically and geologically a disaster-prone region, such as earthquakes, landslide, tsunamis, floods, and volcanic eruptions (2) Indonesia is in the Pacific ring of fire where the region has a lot of tectonic activity. Indonesia is also located on the Eurasian plate, the Pacific, plate along with the Indo-Australian plate which are three active tectonic plates that cause the occurrence of collision zones that then form volcanoes (2-4).

Disaster management is defined as a series of efforts that include the establishment of development policies that pose a risk of disaster, disaster prevention activities, emergency response and rehabilitation that aims to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery (5-6) Education on disaster and emergency is crucial factor (7) Given the fact that an appropriate actions at all phases in the implementation of disaster management is required to achieve greater preparedness, and community people are the first victims and responders to disasters (8,9), a paradigm shift must be addressed that disaster mitigation is immensely effective to be conducted through a preventive approach at the community level, especially to the communities who are prone to disasters (9,10).

Community is the bottom unit of society, hence disaster management that is community-based should be the foundation of the entire society's disaster management system (11) The objectives of community-based disaster management are highly expected to increase public awareness and preparedness, to strengthen the community's ability to deal with disasters by cooperating with related parties, and to increase public knowledge about disaster education and awareness of the importance of safeguarding the possibility of human-made disasters. The involvement of the community in the disaster management cycle, from its basic steps of the process until its ends in the achievement and institutionalization (12), plays

Correspondence to: Arief Hargono, Master Program in Disaster Management, Postgraduate School of Airlangga University, Universitas Airlangga, Surabaya, 60286, Indonesia
E-mail: arief.hargono@fkm.unair.ac.id

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a great importance because local communities better understand and know their environment so that it will be easier to identify and solve disaster vulnerability problems (13).

Disaster awareness and preparedness are part of disaster risk management that refer to measures taken to prepare for and reduce the effect of disasters, to predict and prevent them where possible. Disaster preparedness is a series of activities carried out to anticipate disasters through organizing and through appropriate and useful steps (14) Disaster preparedness indeed involves proactive measures taken by governments, organizations, communities, or individuals to effectively respond and manage the immediate consequences of disasters, regardless of whether they are caused by human activities or natural hazards. The primary goal is to minimize the loss of life and livelihoods associated with disasters (15,16).

To achieve a community that is well-prepared to face disasters, there must be an awareness of the community. By having disaster awareness, the community is expected to be able to know what disasters will occur around them, whether the disaster has a serious impact or not, and whether the disaster is classified as a hazard or not for themselves, their environment and the people around them (17) Hence, the disaster preparedness effort requires participation from various parties (18) as it is essential for households and communities. However, studies showed that many communities remain unprepared (19,20).

Research in Turkey showed that respondents who take part in community disaster awareness training have better behavior in disaster preparedness. However, it is further evidence that reported preparedness behavior is still considered low. These results led to important implications for modifying sustainable behavior change programs, which are likely to reduce the impact of future disasters (21) Another survey to determine community's perception among more than 300 residents along the West Coast of Washington State also found that levels of preparedness for tsunami hazards were recorded at low to moderate levels (22) A study in the Philippines stated that it is important to carry out massive socialization of disasters to local communities so that they will be more aware of the causes and consequences of disasters (23). It is also evidenced that community's approach to tsunami mitigation and preparedness has been proven to be possible (24) This is in line with a report from Asian Disaster Reduction Center in 2002 that stated that continuing awareness, resources, and good management both in normal times and during disasters are essential in increasing the coping capacity of the people.

To assess the probability of occurrence for a given threat, there are two essential elements that are important to be recognized, such as hazard (i.e. the degree of susceptibility of the element exposed to the source of threat) and vulnerability (i.e. the susceptibility of the exposed elements based on physical, social, economic, and environmental conditions). As a key element in the risk equation, there is a growing interest in linking the positive capacities of people to cope, withstand, and recover from the impact of hazards to the recognition of vulnerability as it conveys the potential for managerial and operational capabilities to reduce the extent of hazards and the degree of vulnerability (25).

$$\text{Risk} = \frac{\text{Hazard (H)} \times \text{Vulnerability (C)}}{\text{Capacity}}$$

Indonesia is one of the world's most vulnerable countries to disasters. However, there is not enough study that assess the current situation of the capacity of the community to cope with disasters in Indonesia. Furthermore, research on awareness and disaster preparedness during the COVID-19 pandemic is still very scarce. Until now, Indonesia is still grappling with the challenges posed by COVID-19. However, amidst these efforts, natural disasters have added to the distress. In the early months of 2021, a series of natural disasters struck Indonesia, resulting in hundreds of casualties (26) Public awareness of disaster preparedness is crucial in order to minimize the impact of disasters on the community and reduce the transmission of COVID-19. Therefore, this study was aimed to analyze the levels of and relationship between disaster awareness and preparedness of the community in Indonesia.

Materials and methods

Ethical clearance. This study has been reviewed on behalf of Faculty of Dental Medicine Health Research Ethical Clearance Commission, Universitas Airlangga, Indonesia, No:365/HRECC.FODM/VII/2021.

Study setting. The design of this study is cross-sectional using quantitative data. Research respondents are those who are accessible and willing to fill out this survey voluntarily. The research was conducted in March-October 2021 with the whole nation as the research location. The size of the sample was 400 respondents according to the results of estimation calculations.

Data collection. Data was collected during the COVID-19 pandemic, and the data collection was conducted using an online questionnaire distributed through social media platforms. To minimize duplication of responses, the questionnaire was designed with closed-ended questions and could only be filled out once based on the respondent's email. Prior to filling out the questionnaire, respondents were asked for their willingness to participate in the research. The questionnaire's validity and reliability were tested before data collection took place.

Variable measurement. The questionnaire used in the study was adopted and translated into Indonesian from Tuladhar *et al* (2015) compiled based on advice from various books and literatures (27) The research questionnaire consists of 3 (three) parts; i) characteristics of the respondents, ii) assessment of current awareness level of the community towards disaster, and iii) assessment of community preparedness for disaster preparedness efforts.

Characteristics of the respondents were assessed in age (years), education level, occupational, and disaster experience. Education level was categorized into not graduated from elementary school, graduated from elementary school, junior secondary education, senior secondary education, university education. Occupational was categorized into students, civil servants, private sector employees, farmers/farm workers/fisherman, housewives, entrepreneurs, others.

Disaster experience was categorized into have had disaster experience and have not had disaster experience. Assessment

Table I. Formula to categorize community awareness and preparedness in Indonesia.

Scale	Formula
1	$X \leq M-1.5SD$
2	$M-1.5SD < X < M-0.5SD$
3	$M-0.5SD < X \leq M+0.5SD$
4	$M+0.5SD < X \leq M+1.5SD$
5	$M+1.5SD < X$

of current awareness level of the community towards disaster consisted of 7 items of questionnaire which include: i) participation in voluntary activities for disaster awareness campaign, ii) awareness of retrofitting of buildings, iii) preparation of emergency bag for disasters, iv) relationship between the respondents and community in the neighborhood, v) perception on the maintenance of road blockage and transportation break, vi) attitude towards the importance of disaster awareness, and vii) attitude towards the importance of recovery after disaster.

Community preparedness for disaster preparedness efforts was assessed through 6 items of questions which include: i) perception on disasters and loss of life, ii) attitude towards the importance of disseminating disaster experiences and knowledge, iii) the capability of the government to provide necessary facilities after an occurrence of disaster, iv) confidence and trust in the government for reconstruction activities after an occurrence of disaster, v) attitude towards the importance of talking about disasters, and vi) participation of the respondents in listening to experts or disaster risk reduction leaders who work or do activities for disaster management.

Data obtained through surveys will be measured using 5-point Likert scale referring to the statements. Positive statements regarding disaster awareness and preparedness will be scored from 1 to 5. On the other hand, negative statements will be scored from 5 to 1. The level of awareness and preparedness are categorized using the formulas that are presented in Table I. Scale 1 to 3 are considered as respondents who have low level of disaster awareness and preparedness. Furthermore, scale 4 to 5 are considered as respondents who have high level of disaster awareness and preparedness (Table I).

Analysis data. Univariate analysis is carried out to describe the distribution of the variable using frequency and percentage. Bivariate analysis is then performed to show the relationship between disaster awareness and preparedness of the community in Indonesia using the Chi Square test.

Results

There are 400 respondents involved in this study. The age mean of respondents was 25.26±9.35 years. Most of the respondents have finished senior secondary education (51.3%) and are currently working as students (59.5%). The number of respondents who have had disaster experience (59.8%) is larger than those who have not (40.3%) (Table II).

Regarding current awareness of the community towards disaster, 28% respondents expressed strongly disagree that

Table II. Characteristics of the respondents.

Characteristic of respondent	n (%) or Mean ± SD
Age (years)	25.26±9.35
Education Level	
Not graduated from elementary school	1 (0.3%)
Graduated from elementary school	4 (1.0%)
Junior secondary education	9 (2.3%)
Senior secondary education	205 (51.3%)
University education	181 (45.3%)
Occupational	
Students	238 (59.5%)
Civil servants	8 (2.0%)
Private sector employees	76 (19.0%)
Farmers/farm workers/fishermen	3 (0.8%)
Housewives	31 (7.8%)
Entrepreneurs	23 (5.8%)
Others	21 (5.3%)
Have/have not had disaster experience	
Have	239 (59.8%)
Have not	161 (40.3%)

respondents had participated in activities as volunteers in disaster awareness campaigns, 52% respondents strongly agreed that the adjustment of building construction in the face of disasters was important, 26.3% respondents agreed that respondents provided bags containing necessities in an emergency, 72% respondents strongly agreed that road and transportation improvements were important. In terms of dissemination of disaster information and experience, 43.8% respondents strongly agreed that respondents had a good relationship with the community around the residence. In addition, most of the respondents (72.3%) strongly agreed that disaster awareness, both at the district/city, provincial, and national level, was a priority, 76.5% respondents strongly agreed that post-disaster recovery was important (Table III).

Most respondents (48.8%) thought it was a stroke of luck to stay alive in the face of a disaster. In contrast, 6.3% of respondents expressed neutral and 1.1% of respondent expressed disapproval that disaster experience or knowledge is important. Regarding the post-disaster event, only 24.1% of respondents (agree=18.3%, strongly agree=74.5%) thought that after a disaster, they would not face any problems because the government had provided sufficient facilities. Most respondents gave a positive response to the trust in the government in carrying out reconstruction activities (restoration of facilities and infrastructure) that will be carried out by the government after the disaster occurred. Most respondents (87.8%) stated that talking about disasters to relatives, neighbors, and relatives is important. Most respondents (72.3%) said they had heard of an explanation from experts about disaster risk reduction. Only a small percentage (9.8%) said they had never (Table IV).

Respondents with lower current awareness level of the community towards disaster (78.6%) had higher risk to have lower community preparedness for disaster preparedness efforts

Table III. Descriptive analysis of current awareness level of the community towards disaster in Indonesia.

Statement	Frequency (n=400)	%
I used to participate in voluntary activities for disaster awareness campaigns		
Strongly disagree	112	28
Disagree	107	26.8
Neutral	67	16.8
Agree	69	17.3
Strongly agree	45	11.3
I am aware of retrofitting of buildings		
Strongly disagree	8	2
Disagree	7	1.8
Neutral	40	10
Agree	137	34.3
Strongly agree	208	52
I used to prepare emergency bag for disasters		
Strongly disagree	68	17
Disagree	86	21.5
Neutral	67	16.8
Agree	105	26.3
Strongly agree	74	18.5
I have a good relationship with my neighbors and community		
Strongly disagree	3	0.8
Disagree	12	3
Neutral	71	17.8
Agree	139	34.8
Strongly agree	175	43.8
I think repair of road blockage and transportation break are important		
Strongly disagree	2	0.5
Disagree	5	1.3
Neutral	29	7.3
Agree	76	19
Strongly agree	288	72
I give priority to disaster awareness in local, regional, and national level		
Strongly disagree	1	0.3
Disagree	0	0
Neutral	33	8.3
Agree	77	19.3
Strongly agree	289	72.3
I know recovery after disaster is a crucial work		
Strongly disagree	0	0
Disagree	3	0.8
Neutral	21	5.3
Agree	70	17.5
Strongly agree	306	76.5

compared to respondents with higher community preparedness for disaster preparedness efforts (52.9%). Respondents with lower current awareness level of the community towards disaster had higher risk 1.49 times to have lower community preparedness for disaster preparedness efforts compared to respondents with higher community preparedness for disaster preparedness efforts (PR=1.49, 95%CI=1.25-1.76, P<0.001) (Table V).

Discussion

This study showed that there is a significant relationship between current awareness level of the community towards disaster and community preparedness for disaster preparedness efforts in Indonesia. A large number of respondents with low level of disaster preparedness (69.8%) was also found in

Table IV. Descriptive analysis of community preparedness for disaster preparedness efforts in Indonesia.

Statement	Frequency (n=400)	%
I think to come across a disaster and remain alive depends on our luck		
Strongly disagree	19	4.8
Disagree	22	5.5
Neutral	47	11.8
Agree	117	29.3
Strongly agree	195	48.8
I know importance of disseminating experiences or knowledge of disaster		
Strongly disagree	1	0.3
Disagree	3	0.8
Neutral	25	6.3
Agree	73	18.3
Strongly agree	298	74.5
I know government will provide enough facilities after disaster and we will not face any problem		
Strongly disagree	62	15.5
Disagree	99	24.8
Neutral	143	35.8
Agree	73	18.3
Strongly agree	23	5.8
I am confident for reconstruction activities from government after disaster		
Strongly disagree	13	3.3
Disagree	39	9.8
Neutral	118	29.5
Agree	149	37.3
Strongly agree	81	20.3
I know the importance of talking about disasters with neighbours, friends, and colleagues		
Strongly disagree	3	0.8
Disagree	10	2.5
Neutral	36	9
Agree	144	36
Strongly agree	207	51.8
I used to listen experts or disaster risk reduction leaders who work or do activities for disaster management		
Strongly disagree	14	3.5
Disagree	25	6.3
Neutral	72	18
Agree	162	40.5
Strongly agree	127	31.8

this study. This is in accordance with previous studies that reported low to moderate level of skills related to disaster preparedness in various populations in Indonesia (28,29) Low level of preparedness is evidenced to be responsible to high vulnerability of individuals and communities towards disasters that refers to high degree to which someone's life and livelihood are put at risk (30).

In particular, it evidenced that disaster awareness translates into disaster preparedness. The relationship between awareness and disaster preparedness has been extensively researched in several previous studies. A study in South of Zambales, Philippines in 2020 showed that there is a significant link

between awareness and disaster preparedness among local communities (23) The linear relationship of disaster awareness and preparedness was also found by Suryaratri *et al* (2020) which stated that the higher public awareness of disasters, the higher the preparedness for disasters (17) The study even found that 50.5% of household preparedness in the in Banten Sub-District, Indonesia is determined from its awareness of disasters. Similar finding conveyed by Tada *et al* (2021) who through a survey proved that people who are declared ready for disasters have a high score on the disaster prevention awareness scale (31) A study in the Philippines even highlighted that it is necessary to increase public awareness and

Table V. Relationship between current awareness level of the community towards disaster and community preparedness for disaster preparedness efforts in Indonesia.

Variables	Community preparedness for disaster preparedness efforts						PR (95%CI)	P-value
	Low		High		Total			
	n	%	n	%	n	%		
Current awareness level of the community towards disaster								
Low	206	78.6	56	21.4	262	100	1.49 (1.25– 1.76)	<0.001
High	73	52.9	65	47.1	100	100		
Total	279	69.8	121	30.2	400	100		

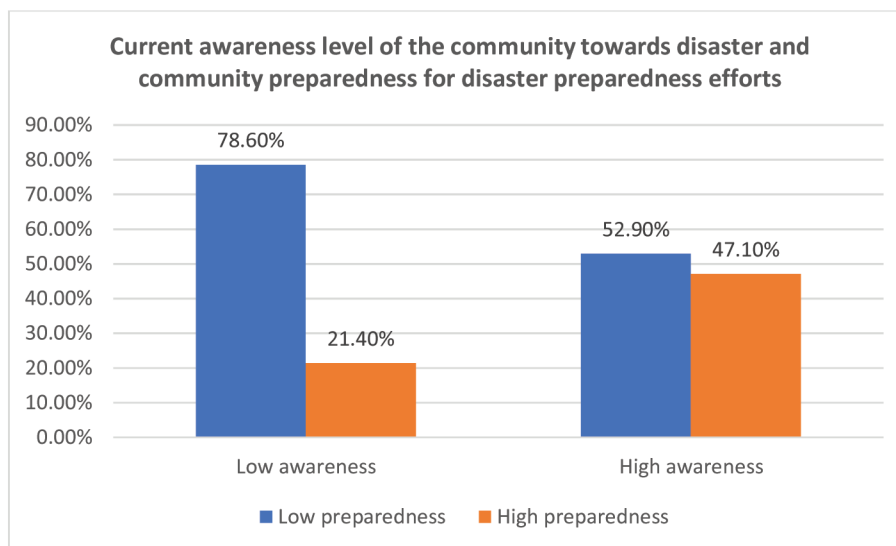


Figure 1. Current awareness level of the community towards disaster and community preparedness for disaster preparedness efforts.

knowledge about potential disasters even in communities that have a relatively lower risk (32).

Knowledge and understanding of disasters and communities are important factors. However, what is even more crucial is effective relationships and communication with the local community (33) Household and individual preparedness are also highly important in facing disaster (20) Research indicates that community engagement strongly supports disaster preparedness activities (2,34) Therefore, to support community understanding of disasters, it is important to disseminate disaster-related information that is easily accessible, comprehensive, and tailored to the needs of the community. This will enable the community to be prepared in facing disasters (35) Regarding the efforts in increasing the disaster awareness of the community, most of the respondents stated that they disagree to participate in any voluntary activity for disaster awareness campaign. The willingness of the community to participate in voluntary activities that are related to disaster awareness campaign is very important. For instance, a study of a community-based educational institution that provides important information regarding the management of disaster education actions was considered beneficial to the shaping of

disaster-aware behaviors of the community and handed positive contributions, both physically and non-physically, in the emergence of community disaster awareness (36).

Regarding the pre-disaster management, most of the respondents expressed their agreements toward the importance in the disaster mitigation, such as preparing emergency bag, buildings retrofitting, and repair of road blockage and transportation break. There is a very close connection between the efforts of disaster mitigation and preparedness. These activities are very crucial in ensuring the success of disaster management cycle as strategies geared strictly toward pre-disaster response are considered to be the only sustainable and cost-effective way of dealing with disasters (37).

Concerning the dissemination of disaster experience or knowledge, majority of the respondents expressed their agreements towards the importance of talking about disaster with their relatives (e.g. neighbours, friends, and colleagues). Most of the respondents also stated that they have good relationships with neighbours and community that are potential to support the efforts of disaster experience or knowledge dissemination. Various studies have shown that the active role of neighbours in disaster preparedness. Beside exerting social influence on the

households to engage in disaster mitigation activities, neighbours also convey social expectations of what vulnerable households should do, carry the risk debate into informal personal networks, and disseminate risk information (38). In disaster-prone areas, neighbours also often pass on warnings to other households, provide assistance in an emergency situation (38), and introduce new community members to the risks of their environment (38,39) as they share similar risks. With all this said, social capital and place-based social networks are evidenced to be predictive of awareness (40,41), preparedness, and of the willingness and ability to evacuate in advance of events of disasters (41).

The support from local government to achieve positive reconstruction and sustainable development through ‘build back better’ concept after the occurrence of disasters is very crucial to accelerate disaster recovery and reduce future vulnerabilities (42) Political trust from the community plays a major role in ensuring the cooperation and is a very important element in disaster management. In respect of the roles of government, there is a big part of our respondents who showed uncertainty and distrust toward the government, especially in the provision of facilities and reconstruction after disaster. Hence, it is very important to gain public trust to achieve good coordination as driving factors in disaster management in Indonesia.

The National Agency for Disaster Management in Indonesia has been initiated ‘*Desa Tangguh Bencana*’ or Disaster Resilient Village that involve local community in community-based disaster risk reduction. This initiation is regulated in Government Regulation of Indonesia Number 21 of 2008 in accordance with the priority strategies in the Master Plan for Disaster Management 2020-2024 which is arranged based on the first National Long-Term Development Plan, the Paris agreement on the United Nations Framework Conference on Climate Change, the 2015-2030 Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction 2015-2030. A disaster-resilient village refers to a village that has the ability to adapt and deal with potential disaster threats, as well as quickly recover from the adverse effects of disasters (43) This effort needs to be reinforced since social values existed in local community are basic capital in achieving disaster resilient districts or cities which has become one of the main goals of disaster management (44).

Our finding showed that the percentage of community members with low level of disaster awareness and preparedness are high. Therefore, the efforts in increasing the disaster awareness and preparedness are needed to be done. Knowledge and understanding of disasters, as well as effective relationships and communication with local communities are very crucial (33).

This study has limitation in terms of the data collection. As the data collection was conducted through online surveys, the respondents that are reached were only those who are accessible and willing to voluntarily fill the self-administered questionnaires. Hence, the results of this study cannot be generalized beyond current particular group. Future research may also provide a quantitative study with random sampling or qualitative investigation to strengthen the results of this study.

Conclusions

Respondents with lower current awareness level of the community towards disaster had higher risk to have lower community

preparedness for disaster preparedness efforts compared to respondents with higher community preparedness for disaster preparedness efforts. Awareness and disaster preparedness during the COVID-19 pandemic are crucial. This is important to minimize the impact of natural disasters on local communities and prevent the transmission of COVID-19 during evacuation processes and at evacuation sites. Therefore, the government should involve the community in disaster management through preparedness plans during the pandemic.

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Availability of data and material

Data and materials are available by the authors.

Contributions

AH, conception of the research and drafting of the manuscript; KDA, EA, PPW, ANT, DKW, EL, review of the manuscript. All the authors approved the final version to be published.

Ethical approval and consent to participate

This study has been reviewed on behalf of Faculty of Dental Medicine Health Research Ethical Clearance Commission, Universitas Airlangga, Indonesia, No:365/HRECC.FODM/VII/2021.

Informed consent

Prior to filling out the questionnaire, respondents were asked for their willingness to participate in the research.

Conflict of interest

The authors declared no potential conflict of interest.

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