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Disaster Preparedness After the 6th February Earthquake Türkiye: Does The Experience Affect The Preparedness?

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ABSTRACT

This study aims to evaluate the disaster preparedness levels of individuals who sought healthcare at a university hospital following the February 6, 2023 earthquakes in Türkiye and to examine the influence of their disaster-related experiences on these preparedness levels. In this study, conducted after the earthquake, the Disaster Preparedness Scale was used to assess participants' disaster preparedness status, and questions were also included to determine disaster-related experiences. Data was analyzed using bivariate analyses and multiple linear regression models. 1,291 participants were included. Significant differences in preparedness scores were found between education, income, building age, and earthquake resistance of their residence house in terms of scale scores ($p < 0.001$). Multiple linear regression analysis showed that the variables of having experienced a disaster before ($\beta=0.770$), psychological impact after the earthquake ($\beta=0.630$), and losing a close relative due to a disaster ($\beta=1.160$) significantly affected disaster preparedness ($p<0.001$). This study reveals the impact of individual disaster experiences on the level of preparedness and shows that factors such as psychological impact and loss of loved ones increase the level of preparedness. The findings emphasize the importance of experience-based approaches in the development of disaster management policies and make original contributions to literature.

Keywords: Disaster Experience, Disaster Preparedness, Earthquake, Public Health

1. INTRODUCTION

Disasters affect millions of people each year and cause significant damage to the development of societies (Ağahan and Demirbilek, 2020). One of the most critical types of disasters is earthquakes, which have occurred -and are likely to occur- in Türkiye due to its location on active fault lines (Gürbüz and Aslan, 2023). The consecutive earthquakes that occurred on February 6, 2023 revealed how vulnerable Türkiye is to earthquakes and were recorded as one of the most devastating natural disasters of recent times (Artantaş and Gürsoy, 2024; Jia et al., 2023). At 04:17 am (Mw 7.8) and 1:24 pm (Mw 7.7) local time, two major earthquakes occurred with epicenters in Pazarcık (Kahramanmaraş) and Elbistan (Kahramanmaraş), respectively. Triggered by a secondary fault branch detached from the main fault of the initial earthquake, the second earthquake occurred within just nine hours—an infrequent phenomenon (Akıncı and Ünlügenç, 2023; Tüysüz, 2023). The occurrence of a second major earthquake in areas already devastated by the first significantly exacerbated the catastrophe. As a result of the earthquakes, a total of 53,537 people lost their lives, 38,901 buildings collapsed, and 26,000 buildings were severely damaged. Spanning 11 provinces along the fault line, these two devastating earthquakes led to severe socioeconomic consequences (Artantaş and Gürsoy, 2024; Yörübulut, 2023; Türkiye Gazetesi, 2025).

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Disaster preparedness is a crucial factor in mitigating the damage caused by disasters and saving lives, particularly in countries with higher disaster risks (Labrague and Hammad, 2024; Tozun et al., 2022). However, numerous studies have shown that individuals and households, even in disaster-prone regions, tend to be largely unprepared for disasters and unfamiliar with emergency response systems (Shannon, 2015, Hargono et al., 2023). In recent years, the literature has identified associations between disaster preparedness levels and factors such as gender, age, marital status, income level, and prior disaster experience (ICMUSS-2023).

Directly experiencing disasters leads individuals to think and communicate about risks and preparedness; it increases social interaction, enhances awareness, and enables a better understanding of the consequences of disasters. In addition, it influences beliefs and emotions, strengthens personal competencies, and raises the level of individual preparedness (Becker et al., 2017). Many studies have examined the relationship between previous disaster experiences and the implementation of preparedness measures, emphasizing the positive impact of disaster experiences on preparedness. In particular, losing a loved one due to a disaster and experiencing psychological distress following a disaster are significant factors associated with disaster preparedness (Onuma, Shin, and Managi, 2017; Castañeda et al., 2020).

Reducing the physical, social, economic, and psychological impacts of disasters largely depends on the level of disaster preparedness. In this context, it is essential to assess preparedness levels, as firsthand experiences raise individuals' awareness and enable them to act more effectively during and after disasters. There is a relatively limited number of studies on the determinants of disaster preparedness in developing countries (Hoffmann and Muttarak, 2017). No nationally representative study has been conducted in Türkiye on household disaster preparedness, making this an important research area for developing disaster management and risk reduction strategies. Identifying the level of disaster preparedness and its influencing factors plays a vital role in implementing policies and interventions to build disaster-resilient communities. Therefore, further research is needed to understand the relationship between individuals' disaster experiences and their preparedness levels.

This study assesses the disaster preparedness level and related factors among individuals over 18 years seeking medical care at a university hospital.

2.METHOD

2.1.Study Design and Population

The study evaluated data from individuals aged 18 and older who visited the outpatient clinic of Gazi University Hospital in Ankara between September 11-15, 2023. The population for this study consists of approximately 25,000 individuals who visited Gazi University Hospital during the specified dates. Using the EpiInfo program, the sample size was calculated to be 1,279 with a 95% confidence interval, α=0.05, d=3%, design effect of 1.0, 50% unknown frequency, and 20% data loss. A total of 1,291 participants were included in the study.

2.2.Data Collection

Ethical approval for the study was obtained from the Gazi University Ethics Committee on 21.08.2023 (Approval No. 2023-988). No financial support was received for the research. The surveys were administered through face-to-face interviews. The questionnaire consists of a total of 29 questions. The first six questions address demographic characteristics, eight focus on the characteristics of the participant's home, and others explore disaster-related knowledge and preparedness, previous disaster experiences before the February 6 earthquake, losing a close relative during the earthquake, and psychological impact. The questionnaire includes two separate questions: the "Disaster Probability Score" and the "Disaster Anxiety Score." Participants were asked to rate the likelihood of any disaster occurring in Türkiye in the next 10 years on a

scale from 0 to 10, which was considered the "Disaster Probability Score." They also rated their concern about a major future disaster on a scale from 0 to 10, which was considered the "Disaster Anxiety Score."

The Disaster Preparedness Scale was developed in Turkish for the first time. The scale consists of 13 items, with a minimum possible score of 13 and a maximum of 52. The validity and reliability analysis of the scale revealed a Cronbach's alpha coefficient of 0.82 (Şentuna and Çakı, 2020).

2.3.Data Analysis

The data were evaluated using the SPSS 23.0 statistical software. In bivariate analyses examining the relationship between "Disaster Preparedness Scale" scores and independent variables, Independent Samples t-test, One-Way ANOVA, and correlation analysis were used. Factors that could influence the "Disaster Preparedness Scale" scores were examined using multiple linear regression. Variables with a p-value of <0.25 in the bivariate analysis were included in the multivariate model. To minimize the effects of multicollinearity among the independent variables in the model, a Variance Inflation Factor (VIF) of <5 was considered. Additionally, the correlation levels between independent variables were examined, but no variables met the condition of r≥0.8. The backward method was applied to the multiple linear regression model. Age and gender were decided to be included in the model regardless of the bivariate analysis results. The independent variables in the model were as follows: Age, Gender (Female=ref), Education Level (No formal education=ref), Household Monthly Total Income (My income is much less than my expenses = ref), Age of the Building (5 years or less=ref), Evaluation of the Earthquake Resistance of the Residence (Very unresistant=ref), Evaluation of the Psychological Impact of the February 6 Earthquake (Not affected at all=ref), Experience of Any Disaster in the Previous Residence Province Before the February 6 Earthquake (No=ref), Loss of a Family Member/Relative Due to Any Disaster (No=ref), Evaluation of the Adequacy of Information Sources Regarding Pre-Disaster Preparations (Very insufficient=ref), " Disaster Probability Score," and " Disaster Anxiety Score." The statistical significance level in this study was set at $p<0.05$.

2. RESULTS

Of the 1,291 participants in the study, 50.7% were female, 58.6% were married, and 61.3% had children. The average age of the participants was 41.24 (SD: 15.4). The highest proportion of participants had an associate degree or bachelor's degree (39.8%), followed by high school graduates (30.8%). Among the participants, 43.8% had an income equal to their expenses, and 29.8% had an income more excellent than theirs. This study showed statistically significant differences in Disaster Preparedness Scale scores based on education level and household monthly income ($p<0.001$) (Table 1). The mean Disaster Preparedness Scale score was 30.10 (SD: 4.7), with a median of 30.0 (IQR 13.0-50.0).

Statistically significant differences were found in terms of Disaster Preparedness Scale Scores between the building age groups, the evaluation groups of the earthquake resistance of the residence, the evaluation of the sufficiency of information sources regarding necessary preparations before a disaster, and the psychological impact of the February 6 earthquake ($p<0.001$). There was no significant difference in scores between those in the affected provinces during the February 6 earthquake and those who were not ($p>0.05$). Participants who had experienced any disaster in the province they resided in before the February 6 earthquake had higher scores ($p=0.002$). Those who lost a family member or relative due to disaster had higher scores ($p=0.007$) (Table 2).

The average score for the "Disaster Probability Score" among the participants was 8.30 (SD: 1.78), and for the "Disaster Anxiety Score," it was 7.78 (SD: 2.14). A correlation was found between the "Disaster Preparedness Scale Scores" and the "Disaster Probability Score" ($r=0.141$, $p<0.001$), the "Disaster Anxiety Score" ($r=0.093$, $p=0.001$), and "Age" ($r=-0.120$, $p<0.001$).

Table 1. Disaster Preparedness Scale Scores According to Some Descriptive Characteristics of the Participants (n=1291)

	n (%) *	Disaster Preparedness Scale Score Mean (SD)	p
Gender			
Female	655 (50.7)	30.04 (4.9)	p=0.630
Male	636 (49.3)	30.16 (4.5)	
Marital Status			
Married	757 (58.6)	30.14 (4.7)	p=0.710
Single	534 (41.4)	30.04 (4.7)	
Having Child			
Yes	792 (61.3)	29.92 (4.7)	p=0.084
No	499 (38.7)	30.38 (4.8)	
Education Level			
No formal education	45 (3.5)	26.53 (4.3)	
Primary school graduate	111 (8.6)	27.74 (4.3)	**p<0.001**
Secondary school graduate	99 (7.7)	28.41 (4.6)	
High school graduate	398 (30.8)	30.12 (4.5)	
Associate and Bachelor's degree	514 (39.8)	30.71 (4.6)	
Master's Degree and above	124 (9.6)	32.23 (4.7)	
Household Monthly Income			
Income much less than expenses	98 (7.6)	28.18 (4.8)	
Income is less than expenses	242 (18.7)	28.65 (4.8)	
Income is equal to expenses	566 (43.8)	29.90 (4.2)	**p<0.001**
Income is a little more than expenses	333 (25.8)	31.36 (4.7)	
Income is more than expenses	52 (4.0)	34.42 (4.8)	

Table 3 shows the evaluation of the effects of some factors on the participants' "Disaster Preparedness Scale" score with a multiple linear regression model. According to the model created with these parameters; education level (β=0.654), total monthly income of the household (β=0.784), age of the building (β=-0.282), evaluation of the earthquake resistance of the house (β=0.511), having experienced a disaster in the city before the February 6 earthquake (β=0.770), being psychologically affected by the February 6 earthquake (β=0.630), the variables of having lost one of the family members or relatives due to any disaster (β=1,160), perceiving the sources of information on pre-disaster preparations as sufficient (β=0,422), "Disaster Probability Score" (β=0,154) were correlated with the "Disaster Preparedness Scale" score. In the final step of the multiple linear regression analysis conducted using the backward elimination method, age, gender, and the "Disaster Probability Score" were not found to be statistically significant.

Table 2. Evaluation of Disaster Preparedness Scores According to the Participants'

	n (%) *	Disaster Preparedness Scale Score Mean (SD)	p
Age of the Living Building			
25 years or older	240 (18.6)	28.85 (4.8)	
21-25 years	123 (9.5)	29.25 (4.2)	
16-20 years	207 (16.0)	29.91 (4.5)	
11-15 years	269 (20.8)	30.62 (4.4)	**p<0.001**
6-10 years	210 (16.3)	31.22 (4.7)	
5 years or less	105 (8.1)	32.46 (5.6)	
I don't know	137 (10.6)	28.74 (3.6)	
Plan to Perform Earthquake Resistance Test on the Residence			
Yes	297 (23.0)	30.36 (4.6)	p=0.283
No	994 (77.0)	30.02 (4.7)	
Evaluation of the Earthquake Resistance of the Residence			

Very resistant	75 (5.8)	32.28 (4.6)	**p<0.001**
Resistant	549 (42.5)	31.04 (4.7)	
No opinion	412 (31.9)	28.80 (4.1)	
Unresistant	228 (17.7)	29.67 (4.9)	
Very unresistant	27 (2.1)	28.30 (5.8)	
Evaluation of the Adequacy of Information Sources Regarding Pre-Disaster Preparations			**p<0.001**
Very sufficient	27 (2.1)	31,67 (7.3)	
Sufficient	350 (27.1)	31,23 (4.6)	
Undecided	312 (24.2)	29,26 (4.5)	
Insufficient	487 (37.7)	29,82 (4.5)	
Very insufficient	115 (8.9)	29,73 (4.7)	
The City of Residence During the February 6 Earthquake			p=0.771
One of the cities affected by the earthquake	85 (6.6)	29,95 (4.8)	
A city outside the disaster area	1206 (93.4)	30,11 (4.7)	
Evaluation of the Psychological Impact of the February 6 Earthquake			**p<0.001**
Very affected	612 (47.4)	30,40 (4.7)	
Affected	598 (46.3)	30,07 (4.6)	
Undecided	47 (3.6)	28,94 (4.9)	
Not affected	32 (2.5)	26,56 (5.7)	
Not affected at all	2 (0.2)	29,50 (4.9)	
Experience of Any Disaster in the Previous Residence Province Before the February 6 Earthquake			**p=0.002**
Yes	364 (28.2)	30.75 (4.6)	
No	927 (71.8)	29.84 (4.7)	
Loss of a Family Member/Relative Due to Any Disaster			**p=0.007**
Yes	141 (10.9)	31.12 (4.7)	
No	1150(89.1)	29.97 (4.7)	

Housing Characteristics and Disaster-Related Experiences (n=1291)

Table 3. Evaluation of the Influencing Factors on Participants' Disaster Preparedness Scale Scores Using the Multiple Linear Regression Model (n=1291)

Parameters*	**Beta (Standard Error)**	**Standardized Beta**	**p**	**VIF**
Education Level (No formal education = ref)	0.654 (0.110)	0.167	**<0.001**	1.230
Household Monthly Total Income (Income is much less than expenses = ref)	0.784 (0.138)	0.158	**<0.001**	1.203
Age of the Living Building (5 years or less = ref)	-0.282 (0.073)	-0.110	**<0.001**	1.255
Evaluation of the Earthquake Resistance of the Residence (Very unresistant = ref)	0.511 (0.146)	0.097	**0.001**	1.205
Experience of Any Disaster in the Previous Residence Province Before the February 6 Earthquake (No = ref)	0.770 (0.268)	0.073	**0.004**	1.007
Evaluation of the Psychological Impact of the February 6 Earthquake (Not affect at all = ref)	0.630 (0.181)	0.092	**0.001**	1.081
Loss of a Family Member/Relative Due to Any Disaster (No = ref)	1.160 (0.391)	0.076	**0.003**	1.029
Evaluation of the Adequacy of Information Sources Regarding Pre-Disaster Preparations (Very insufficient = ref)	0.422 (0.120)	0.090	**<0.001**	1.032
Disaster Probability Score (0- None, 10 - Definitely Will Happen)	0.154 (0.072)	0.058	**0.033**	1.137

4. DISCUSSION

This study highlights key factors influencing disaster preparedness, focusing on the role of individuals' previous disaster experiences. After the February 6th Earthquake, Ankara, due to its location outside the disaster zone and its well-developed infrastructure, became the city receiving the highest number of migrants from the affected regions; according to official data, approximately 205,405 people migrated to Ankara (International Labour Organization, 2024). This study in Ankara provides valuable insights into how disaster experiences influence preparedness (Migration Research Foundation, 2024).

The study found that disaster preparedness scores improved with higher education levels. Similarly, previous studies in the literature have shown that higher levels of education positively affect disaster preparedness (Castañeda et al., 2020; Ünal et al., 2022; Hoffmann and Muttarak, 2017; Shapira et al., 2018; Tercan, 2022). Additionally, the study revealed that as income increased, preparedness also improved. Previous studies have demonstrated that higher-income households tend to have better disaster preparedness (Kim and Kim, 2022; Zamboni and Martin, 2020; Najafi et al., 2015). These results show similarities with previous studies. Individuals with higher education levels tend to possess advanced research skills, better source evaluation, and critical thinking abilities, leading to greater awareness and information about disaster preparedness. Furthermore, education may indirectly contribute to disaster preparedness by increasing income levels and enhancing individuals' ability to invest in protective measures. Economically disadvantaged populations, both in developing societies and wealthy industrialized nations including wealthy industrialized nations such as the United States, suffer the greatest disaster-related losses and are disproportionately affected (Fothergill, 2004). Low socioeconomic conditions and financial constraints may hinder individuals moving to newer, safer buildings. Indeed, studies show that individuals with higher income and education levels are likelier to purchase newly built homes (Yoon, You, and Shon, 2022; Tosun and Fırat, 2012). To address these challenges, strengthening livelihoods, implementing social protection programs, and enhancing resilience are crucial in reducing disaster risks and alleviating poverty (UNDRR, 2024).

This study revealed that as the age of the building increases, the disaster preparedness scores decrease. Those who perceive their homes as not earthquake-resistant tend to have lower preparedness levels. The Marmara earthquake of August 17, 1999, which resulted in approximately 17,000 deaths, is considered one of the most impactful earthquakes in Türkiye before the February 6 earthquakes (Arslan et al., 2023). Since then, the disaster management system in Türkiye has undergone significant transformations, including detailed regulations and improved earthquake-resistant building designs. However, considering that over 60% of the buildings in the country were constructed before 2000, older buildings remain vulnerable to earthquakes, and their occupants tend to have lower preparedness levels (Cansız, 2022; Meydan and Yıldız, 2019). This situation constitutes an important risk in the event of major earthquakes. Therefore, there is a need to expand educational and informational campaigns to raise public awareness and preparedness for disasters. In particular, projects that encourage active community participation in disaster preparedness should be implemented. The transformation of old and high-risk structures into earthquake-resistant buildings will reduce economic losses and accelerate post-disaster recovery. In this study, 23% of the participants planned to have an earthquake resistance test conducted for their homes. Following the earthquake disaster centered in Kahramanmaraş, there was an increase in building resilience test applications nationwide, with 4,000 applications made to Istanbul Technical University within three months after the earthquake. However, by 2024, this number significantly decreased (Hürriyet, 2024). Although awareness of building resilience tests has increased, sustained public campaigns are necessary to prevent a sharp decline in interest over time.

Participants' disaster experiences were assessed through key variables: whether they had experienced any disaster before the February 6th earthquake, how psychologically affected they were by the earthquake, and whether they had lost a family member or relative due to a disaster. The significance of these variables related to disaster experience in the final model indicates that prior disaster experiences play a crucial role in shaping disaster preparedness. The study found that individuals who had lost a relative in a past disaster were more likely to be prepared than those who had not. Those who had experienced any disaster before

the February 6th earthquake also scored higher than those who had not. This is consistent with studies by Kim et al., who found that individuals with prior disaster experience showed significantly higher household disaster preparedness (Kim and Kim, 2022). Similarly, Murphy et al. identified prior disaster experience as a key interpersonal factor influencing preparedness (Murphy et al., 2009). While some studies have indicated that previous disaster experience is one of the factors influencing disaster preparedness, others have not found a significant relationship (Karimi et al., 2023; Inal, Kocagoz, and Turan, 2012). Although some studies report mixed findings, most agree that prior disaster experience enhances household emergency preparedness. This suggests that individuals with recent disaster experience are more motivated to prepare for future disasters (Rohith et al., 2017). It is thought that the increased social awareness and experiences following the February 6 earthquakes in Türkiye will likely enhance disaster preparedness efforts in the future.It is estimated that a 64% chance of a major earthquake greater than 7.0 will occur in Istanbul within the next 7 years (Duvar English, 2023).The anticipated earthquake poses a significant risk due to factors such as high population density, Istanbul's role as Türkiye's economic and historical center, the vulnerability of old buildings, and urban sprawl (Alparslan et al., 2023). The lessons learned from past disaster experiences are of great importance for enabling Türkiye to take more effective and sustainable measures against potential earthquakes.

This study was conducted approximately seven months after the February 6th earthquake. The results indicate that individuals significantly affected psychologically by the earthquake had higher disaster preparedness scores. While psychological distress from the earthquake may have increased preparedness, it should also be noted that individuals who were already well-prepared and highly sensitive to disasters may have been more severely affected by the earthquake. On the other hand, in Eisenman et al.'s study, individuals who assessed their physical and mental health as fair/poor were less likely to have disaster preparedness materials and an emergency plan (Eisenman et al., 2009). In the study by Öztekin & Örki, it was demonstrated that those who experienced the 6th February earthquakes had higher levels of depression, anxiety, and stress compared to those who did not experience the earthquake. However, it was also observed that higher levels of depression, anxiety, and stress negatively impacted disaster preparedness (Öztekin and Örki, 2023). The differing findings in the literature highlight the complexity of earthquake preparedness and underscore the need for further research.

The study also reveals that all the variables related to disaster experience are associated with disaster preparedness. The Protection Motivation Theory and the Extended Parallel Process Model, both part of Health Behavior Theories, can help interpret the relationship between disaster experience and preparedness. According to these models, when individuals assess the severity and likelihood of a threat, their motivation to engage in protective actions increases (Tsoy et al., 2022). As demonstrated in this study, individuals with previous disaster experiences perceive the threat more clearly, making them more likely to engage in disaster preparedness behaviors. Due to their heightened threat perception, individuals affected by earthquake experiences tend to take preparedness measures to protect themselves and their loved ones. Therefore, prior experiences are crucial in raising awareness and enhancing disaster preparedness.

In this study, bivariate analysis revealed that as participants' scores for the level of anxiety about the likelihood of an earthquake increased, their disaster preparedness scores also increased. The literature reports that higher levels of anxiety enhance earthquake cognition and preparedness. Moderate levels of anxiety encourage individuals to take threats seriously and engage in preparedness. At the same time, if the anxiety level is too high and affects the individuals' psychological well-being, it negatively impacts disaster preparedness (Rüstemli and Karanci, 1999; Mulilis, Duval, and Rombach, 2001; Güzel, 2022; Lloyd’s Register Foundation and Gallup, 2024). Individuals experiencing high anxiety levels may benefit from psychological support, being taught stress management techniques, and being informed with accurate and up-to-date information to ensure disaster preparedness.

Finally, the study found that individuals with insufficient information sources regarding pre-disaster preparations had lower disaster preparedness scores. People who face difficulties accessing information sources or perceive them as inadequate may have lower disaster literacy levels, which could negatively

impact their preparedness. Disaster literacy directly influences preparedness, and improving individuals' knowledge enhances their ability to respond effectively (Seifi et al., 2018; Saifudin, 2022; Torpus et al., 2024). However, regardless of individuals, the lack of information sources or limited access to them can also decrease disaster preparedness levels. Therefore, activities such as ensuring the rapid dissemination of information through digital platforms and mobile applications, raising public awareness through community-based programs and educational campaigns, and increasing access to information using visual and auditory materials will play a significant role in disaster preparedness.

5.LIMITATIONS

One limitation of our study is that the data are based on self-reports. Although disaster literacy was recognized as a key factor in preparedness, this study did not include a direct measurement of it. Additionally, since the data was collected approximately seven months after the February 6th earthquake, the time elapsed may have influenced the preparedness scores. Lastly, while the study evaluated general disaster preparedness, it did not address the different phases of disaster management (pre-disaster, during, and post-disaster) in detail. This limits the ability to reflect the dynamics of disaster management fully.

6.CONCLUSION

This study determined that individuals with prior disaster experience who were emotionally affected by the February 6th earthquake and had lost family members in disasters had higher disaster preparedness scores. Additionally, as the Disaster Probability Score increased, disaster preparedness levels rose. These findings suggest that past experiences and perceived risks can influence behavioral patterns within the framework of Health Behavior Theories. Although disaster awareness in society increased following the February 6th earthquake, this awareness will likely diminish over time. Keeping the results of past earthquakes fresh in memory may encourage individuals to take disaster preparedness measures. Local governments, civil society organizations, and disaster management units can develop awareness campaigns, drills, and educational programs to enhance preparedness.

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