Psychological Experiences and Risk Factors in Earthquakes

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Abstract

This study is an attempt to explore the prevalence of post-traumatic stress, anxiety, depression and sleep disorders in those affected by the 6 February 2023 earthquake in Turkey. The study also aims to examine the PTS, anxiety, depression and sleep disorders experienced by earthquake survivors in terms of some variables (receiving psychological help, residing in the earthquake area, moving to a different settlement after the earthquake, gender, marital status, perceived income). Having a quantitative research design, this study employed relational survey model. The participants consisted of 310 people over the age of 18 who were chosen by convenience sampling method. 60.65% of the participants encompassed those who experienced the earthquake. The study deployed personal information form, PCL, HADS, and SDS as data collection tools. Descriptive statistics, PMCC, independent samples *t*-test, one-way ANOVA and multiple regression analysis were used during data analysis. The findings revealed that 46.8% of the earthquake survivors experienced post-traumatic stress, 42.2% anxiety, 22.4% sleep disorders and 12% depression symptoms. Anxiety attitudes, sleep disorders and gender predicted post-traumatic stress experienced by earthquake survivors. The findings also suggested that PTS, anxiety and sleep disorders levels of earthquake survivors receiving psychological help significantly differed from those who did not. However, no difference was identified across depression symptoms. Gender is a risk factor for post-earthquake psychological disorders. The survivors' leaving the area where they experienced the earthquake did not significantly contribute to their psychological well-being. This study is expected to provide support for NGOs and policy makers in the disaster preparedness process and for mental health professionals to gain a new perspective on understanding the psychological state of people exposed to disasters and develop appropriate interventions.

Keywords: Anxiety, Depression, Earthquake, Psychological Effects, Psychological Help, Post-traumatic Stress, Risk Factors, Sleep Problems,

Introduction

People experience various emotional and behavioral problems after unpredictable events such as earthquakes. Traumatic stress, anxiety, depression and sleep disorders are among the problems experienced after the earthquake (Beaglehole et al., 2019; Zhang et al., 2014). The psychological problems observed after the earthquake are generally similar despite some differences. For instance, maladaptive problems such as functional impairments in the mind, panic attacks, suicide and behavioral disorders (e.g., antisocial behavior) may occur (Gerstner et al., 2020; Marthoenis et al., 2019). This difference may be due to the demographic characteristics of the earthquake survivors (Başoğlu et al., 2014) and

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psychological mechanisms (e.g., social support, resilience, attachment, empathy) (Wang et al., 2020) as well as the social and political structures in the earthquake region (Gerstner et al., 2020). Thus, it is essential to conduct more earthquake-themed studies focusing on different cultural and psychological variables to provide disaster preparedness and effective social as well as psychological support after the earthquake.

A major natural disaster occurred in Turkey on February 6, 2023. More than 164 thousand buildings were destroyed, over 50 thousand people died and approximately 10 million people were directly affected in the earthquake that took place in 10 different cities of the country (Ekici, 2023). This earthquake can be considered as one of the biggest earthquakes in the world due to its devastating results (Laleoğlu, 2023). Earthquakes lead to the destruction of buildings, destruction of livelihoods, financial losses along with deaths and serious organ losses. It is inevitable that such traumatic experiences will have serious psychological consequences for the people living in the region (Kolbe et al., 2010). In fact, people who have not experienced an earthquake but live in other regions with possible earthquake risk may also be traumatized (Dai, et al., 2016; Eroğlu et al., 2017). Therefore, it may be wise to choose the research sample from people living in earthquake-affected and unaffected regions.

Witnessing a natural disaster is a traumatic experience that impacts people deeply and causes reactions such as severe anxiety and stress (Kar & Bastia, 2006). Post-traumatic stress reactions or anxiety-based problems are the most common mental problems after an earthquake (Knipe, 2021; Lewis et al., 2019). Besides, panic attacks, depression, suicide, sleep problems, antisocial behaviors may accompany post-traumatic stress reactions (Altındag et al., 2005; Cénat, et al., 2020; Gerstner et al., 2020; Marthoenis et al., 2019). Studies on post-earthquake psychological problems have been reviewed in the national and international literature (Adhikari Baral & Bhagawati, 2019; Aker, 1999; Beaglehole et al., 2019; Cengiz & Peker, 2023; Cénat, et al., 2020; Gerstner et al., 2020; Karabacak Çelik, 2023; Marthoenis et al., 2019; Önder et al. 2006; Taşcı & Özsoy, 2021; Uğuz, 2023; Xi et al., 2020; Yalçın, 2023). However, there is a dearth of studies conducted on earthquake-related psychological mechanisms (Liu, et al., 2023; Wang et al., 2020). The fact that earthquake effects are characterized by the political and social structure of countries (Norenzayan, 2010) calls forth the necessity of carrying out more research on earthquakes. Post-traumatic stress symptoms and anxiety are observed in approximately half (between 9-57%) of people directly/indirectly affected by earthquakes (Udomratn, 2008). In addition, serious (8-29%) depression-oriented problems may occur (Başoğlu et al., 2004; Derivois et al., 2017; Gerstner et al., 2020). The psychological problems related to the earthquake disaster, the severity of the earthquake, the level of being affected by the earthquake (loss of relatives or financial loss), being in the earthquake zone, any natural disaster experience, receiving psychological help, and variables such as age and gender affect the frequency of possible psychological problems regarding the traumatic experience (Dai, et al., 2014). Several studies revealed that earthquake survivors' personality traits (empathy, attachment, personality, negativity belief, etc.) are associated with problems such as experiencing panic attacks or anxiety after the earthquake, and getting depressed (Khazaie et al., 2019; Liu, et al., 2023; Taşçı & Özsoy, 2021; Yin et al., 2019). Moreover, the limited number of studies on sleep problems and earthquakes are highly remarkable. There is no such a study specifically conducted on exploring sleep disorders, being/not in the earthquake zone, and receiving psychological help in terms of psychological experiences. Those with sleep disorders may experience cognitive dysfunctions such as lack of concentration, attention and memory impairment, problems such as seeing objects or people farther than they are, and feeling like

they are in a dream (Arnulf et al., 2005). These problems are likely to reduce people's adaptability. Therefore, it is of upmost importance to identify and evaluate the stress triggers experienced after the earthquake and to gain healthy sleep habits. Because sleep disorders may increase the frequency of anxiety attacks (Khan & Slowik, 2022). Receiving psychological help acts as a protective function against gaining insight, regaining impaired functionality, changing problem behaviors and risky situations (Türkçapar, 2021; Leeds, 2022). This study differs from those in that it focuses on the variables such as receiving psychological help, sleeping disorders and still living in the earthquake zone.

While the physical consequences of the earthquake are easily identified, the psychosocial consequences are often not (Udomratn, 2008). Even if the problems of traumatized people decrease over time, they do not disappear without effective psycho-social support (Cénat, 2018). It is most probable that the way to cope with the problems related to the traumatic event is to increase the intelligibility and predictability of the psychological mechanisms. The post-earthquake psychological experiences vary across culture (sample selection), severity of the disaster, time passed after the disaster, and methodological methods (Wang et al. 2000), which urged us to credit the significance of this study. Considering the chaos experienced with the earthquake (e.g., seeking help), it is a great need to investigate more psychological mechanisms related to the earthquake. Identifying the type and level of psychological problems after the earthquake is vital for the development of effective intervention studies (Dai, et al., 2014; Dell'Osso et al., 2013). Understanding the psychosocial mechanisms underlying mental problems caused by traumatic experiences such as earthquakes may increase the predictability of these problems. One may investigate whether there exist psychological mechanisms not previously observed in the literature that influence post-disaster mental health. Besides, the results of the study are expected to provide psychological help methods characterized by the psychological needs of the people living in the earthquake region.

This study is an attempt to reveal the levels of post-traumatic stress, anxiety symptoms, being depressed and having sleep disorders due to the earthquake that took place on February 6, 2023. Besides, the study aims to examine post-traumatic stress, anxiety, depressive symptoms and sleep disorders in terms of seeking psychological help and some other variables (e.g., gender, marital status, perceived economic level, being in an earthquake zone, etc.).

Method

Participants

This study employed quantitative relational survey method to investigate the post-traumatic stress, anxiety, depressive symptoms and sleep disorders experienced by volunteers over the age of 18 in terms of some variables and to reveal the current situation. Relational survey method provides an idea about the relationship between variables within a group (Fraenkel et al., 2012; Sönmez & Alacapınar, 2017). The sample was chosen by convenient sampling technique. Despite some limitations, the convenient sampling technique is preferred as it is economical and provides convenience to researchers (Fraenkel et al., 2012). Besides, the validity and reliability of the results are ensured through controlling these limitations with various statistical processes (Barker et al., 2002). The sample consisted of 310 people over the age of 18 (F= 72.6%; M= 27.4%, age $\bar{x}$= 26.65, ±7.97). The sample size was determined based on the principle that the sample should be at least five times the number of items (number of participants 200 fair; 300 good; 500 very good; over 1000 excellent) (DeVellis, 2017).

Among the participants, 82.6% are single and 17.4% married. Of the participants, 74.1% are university graduates, 18.7% high school graduates, and only 7.2% are primary school graduates. With regard to the income level (perceived income), 78.7% of the participants were found to have a medium income, 19% low income, and 2.3% high income. Considering the earthquake survivors as a separate research group (n= 188), 78.7% are females and 21.3% are males, with a mean age of 27.34 (*sd*= ±8.87).

Measures

Personal Information Form

The demographic information form includes questions related to gender, age, marital status, level of education, earthquake experience, residence in the earthquake zone, settling in a different settlement after the earthquake and receiving psychological support.

PTSD Checklist for PCL-5 (PTSDC)

The checklist is a screening tool for assessing posttraumatic stress disorder (PTSD). The tool was adapted to Turkish Culture by Boysan et al. (2017). It was designed based on the PTSD diagnostic criteria in DSM V. It has best fit with DSM-5 PTSD diagnostic criteria with 20 questions and four factors on symptom clusters of re-experiencing, avoidance, hyperarousal, and negative alterations in mood and cognition. The reliability coefficients were .79-.92 for re-experiencing, .73-.91 for avoidance, .81-.88 for hyperarousal, .85-.90 for negative alterations in mood and cognition. The 20-item measure rated on a five-point Likert scale, and each question is expected to be answered between "not at all bothersome" (0) and "extremely bothersome" (4). The total symptom score is calculated by adding the scores in each item, and it is recommended to use the cut-off score of 47. The cut-off score of 47 and above seems to be appropriate for clinical use (Boysan et al., 2017). The reliability coefficients of the scale were identified as .88 for re-experiencing, .83 for avoidance, .86 for hyperarousal, .88 for negative alterations, and .93 for the overall scale in the present study.

Hospital Anxiety-Depression Scale (HADS)

Turkish validity and reliability studies of the scale were conducted by Aydemir et al. (1997). The scale includes 14 items, with odd numbers measuring anxiety and even numbers referring to depression. While the 1st, 3rd, 5th, 6th, 8th, 10th, 11th and 13th items are scored as 3, 2, 1, 0, the 2nd, 4th, 7th, 9th, 12th and 14th items are scored as 0, 1, 2, 3. The cut-off point is 10 for the anxiety subscale and 7 for the depression subscale. The reliability coefficient of the scale is .85 for the anxiety subscale and .77 for the depression subscale. The reliability coefficients of the scale in the current study were determined as .76 and .63 for anxiety and depression, respectively, and .64 for the entire scale.

DSM-5 Sleep Disorder Scale (SDS)

Being a 5 point-Likert type, the scale was adapted to Turkish culture by Yüzeren et al. (2017) to determine the intensity of sleep disorder. The scale holds eight items and a single factor structure, which explains 63.4% of the variance. The factor loadings of the scale items range from .69 to 80. The Cronbach alpha coefficient for the scale is .91. Each item is scored on 1-5 and the range of points is between 8-40. Having a clinical score of 54 and less means that there is no sleep disorder; 55-59 point range may indicate mild sleep disorder; 60-69 moderate intensity; 70 and above severe intensity (Cited in Yüzeren et al., 2017). The reliability coefficient of the scale was determined as .75 in this study.

Process and Analysis

Data collection process was initiated in line with the diagnosable period (after the first 2-3 months) of the psychological disorders experienced by earthquake survivors (Math et al., 2015). In this regard, permission was obtained from Ordu University Social and Human Sciences Ethics Committee (dated 07.06.2023 and numbered 2023-152). Data were collected face-to-face or online (Instagram, Whatsapp, etc.) from those who came and settled in Ordu and surrounding provinces from the earthquake region (dormitories, hotels, guesthouses, free home applications) and volunteers who provided financial or in-kind aid to earthquake victims. The research form involves an information instruction about the scope and content of the research as well as an informed consent form. The data were analyzed through use of SPSS 23.0 package programs. Missing and erroneous data were removed from the data set before analysis. The normality of the data was tested, and thus the kurtosis-skewness coefficients met the normality criteria (-1, +1). Besides, Levene's test values were examined for some analyzes (e.g., t-test), and the results were identified to meet the assumption of homogeneous distribution of variances (P>.05) (Pallant, 2020). Descriptive statistics, Pearson Product-Moment Correlation Coefficient (PMCC), independent samples t-test, one-way ANOVA and multiple regression analysis techniques were used during data analysis.

Findings

This study, which was carried out to determine the psychological effects experienced after the earthquake, first examined the relationships between the variables. The differences between those who experienced earthquakes and those who did not were tested. The findings revealed a high level of positive correlation between post-traumatic stress symptoms and anxiety, a low level of negative depression symptoms, a high level of having sleep disorders, and a medium level and positive correlations between gender ([r ≥ 0, low, r ≥ 0.3 medium and r ≥ 0.5 high] Cohen, 1994). A similar level of relationship was identified between the post-traumatic stress symptoms of those who were not earthquake survivors and the aforementioned variables, yet no relationship was determined across gender. Table 1 depicts the analysis in which all participants were included.

Table 1

Correlations between Variables

	Anxiety	Depression	Sleep	Gender
PTSD in earthquake victims (n= 188)	.71**	-.15*	.59**	.24**
PTSD in those who are not earthquake victims (n=	.62**	-.24*	.45**	.08
PTSD in all participants (n= 310)	.68**	-.17*	.54**	.16**

** *p*<.01; * *p*<.05

This study analyzed the PTSD, HAS, HDS and SDS scores of people who experienced and did not experience earthquakes. Accordingly, 46.8% of the people who experienced an earthquake met the criteria for post-traumatic stress symptoms (47 and over from the whole scale) (Boysan et al., 2017). Severe anxiety symptoms were identified in 42.2% of the earthquake victims, while depression symptoms were observed in 12% (15 points and above; Aydemir et al., 1997). Besides, 22.4% of them had

medium or higher symptoms of sleep disorders (60 and above; Yüzeren et al., 2017). On the contrary, people who have not experienced earthquakes were noted to have low scores of post-traumatic stress, anxiety, depression and sleep disorders. For instance, it may be wise to mention that only 18.2% of those who did not experience earthquakes met the criteria for post-traumatic stress symptoms. Besides, t-test results suggested that post-traumatic stress (t= 3.38, p<.05, d= .39), anxiety (t= 2.08, p<.05, d= .24) and sleep disorder (t= 2.58, p<.05, d= .30) scores differed significantly across earthquake survicors and those who were not; however that is not case for depression symptoms (t= -.12 p= .86). Thus, the symptoms of depression did not differ across the earthquake experience, and the 6 February earthquake may activate the post-traumatic stress, anxiety and sleep disorders in earthquake survivors. Table 2 displays these results.

Table 2.

The Relationship between Earthquake Experience and PTSD, Anxiety, Depression, and Sleep Problems

Variables	Group	N	$\bar{x}$	sd	df	t	p
PTSD	Yes	188	47.01	16.48	308	-3.38	.01
	No	122	40.70	15.13			
Anxiety	Yes	188	13.70	4.46	308	2.08	.03
	No	122	12.62	4.22			
Depression	Yes	188	11.82	3.23	308	-.12	.86
	No	122	11.86	2.91			
Sleep problems.	Yes	188	26.16	5.87	308	2.58	.01
	No	122	24.41	5.70			

The study also examined whether people received psychological support after the earthquake. A statistically significant difference was noted across earthquake survivors who received psychological support after the earthquake and those who did not in terms of post-traumatic stress (t= -4.28, p<.05), anxiety (t= -3.85, p<.05) and sleep disorders (t= -3.43, p<.05), while no difference was identified across depression symptoms (t= .82 p= .41). It is most probable that receiving psychological support is effective in reducing traumatic stress, sleep and anxiety-based problems.

Table 3.

The Relationship between Post-earthquake Psychological Support and PTSD, Anxiety, Depression, and Sleep

Variables	Group	N	$\bar{x}$	sd	df	t	p
PTSD	Yes	34	36.51	18.89	186	-4.28	.01
	No	154	49.30	15.01			
Anxiety	Yes	34	11.11	5.15	186	-3.85	.01
	No	154	14.27	4.10			

Depression	Yes	34	12.23	3.56	186	.82	.41
	No	154	11.73	3.16			
Sleep problems	Yes	34	23.11	6.37	186	-3.43	.01
	No	154	28.85	5.56			

Earthquake victims are placed in safer residential areas after the disaster they have experienced as per local or central policies. *t*-test was conducted to examine the relationship between such practices and research variables. The analyzes revealed no significant difference between the participants who moved to a different settlement from their place of residence after the earthquake and those who did not in terms of the levels of experiencing post-traumatic stress, anxiety, depression and sleep disorders. Analysis results are summarized in Table 4.

Table 4.

The Relationship between Leaving the Region and PTSD, Anxiety, Depression and Sleep Problems

Variables	Group	N	$\bar{x}$	sd	df	*t*	*p*
PTSD	Yes	85	48.95	15.18	186	1.48	.14
	No	103	45.37	17.40			
Anxiety	Yes	85	14.24	4.47	186	1.53	.12
	No	103	13.24	4.43			
Depression	Yes	85	12.01	2.90	186	.69	.48
	No	103	11.68	3.49			
Sleep problems	Yes	85	26.84	5.49	186	1.46	.14
	No	103	26.61	6.14			

The findings showed that earthquake survivors mostly experienced post-traumatic stress symptoms. These findings are congruent with the relevant literature (Taşcı & Özsoy, 2021; Wang et al., 2000). In this regard, this study revealed the variables explaining post-traumatic stress through multiple regression analysis to explain the depression symptoms of earthquake survivors. Anxiety symptoms, sleep disorders and gender were included in the model as independent variables. The autocorrelation was examined through the Durbin-Watson test and the expected value between 1.5-2.5 (Küçüksille, 2010) was reported to be 1.78.

The enter method analysis demonstrated that the model established to explain the marriage attitude was significant ($F_{(3,184)}$= 81.75, p<.01) and that all of the independent variables contributed significantly to the model. The variance in which the selected predictor variables explained the traumatic stress symptoms was 56.4%. Table 5 presents the summary of the established multiple regression model.

Table 5

Multiple Regression Model Summary

Model	*R*	R^2	ΔR^2	ESE	Δ

					ΔR^2	ΔF	*df1*	*df2*	*p*
PTSD	.756	.571	.564	10.88	.57	81.75	3	184	.001

ESE=Estimated Standard Error

As in Table 5, the predictors explaining PTSD symptoms were identified as anxiety symptoms (β= .54), sleep disorders (β= .27) and gender (β= -.10). Depression variable was excluded from the model since it did have a significant contribution to the model.

Table 6.

Multiple Regression Analysis regarding the Prediction of PTS Symptoms of Earthquake Survivors

Model 1	UC		SC	*t*	*p*	
	B	SH	β			VIF
	46.90	1.20		39.12	.01	
Anxiety	2.01	.21	.545	9.53	.01	1.41
Sleep Problems	.77	.16	.275	4.81	.01	1.40
Gender	-4.15	1.97	-.10	-2.11	.03	1.02

The study also investigated the demographic variables of the participants. Independent *t*-test and one-way *ANOVA* were used to analyze the variable of living in the earthquake zone and living outside the earthquake zone. A statistically significant difference was noted across participants in the earthquake area and those who did not live in the earthquake zone in terms of post-traumatic stress (*t*= 4.90, *p*<.001, *d*= -.78), anxiety (*t*= 4.73, *p*<.001, *d*= .65) and sleep behaviors (*t*= 3.08, *p*<.05, *d*= -.43), whereas no significant difference in depressive symptoms (*t*= .12, *p*= .90). Table 7 displays the findings of the analysis.

Table 7.

The Relationship between Living in an Earthquake Zone and PTSD, Anxiety, Depression, and Sleep Problems

Variables	Group	N	$\bar{x}$	sd	df	*t*	*p*
PTSD	Yes	241	47.18	14.36	82.5	4.90	.00
	No	69	35.17	18.85			
Anxiety	Yes	241	13.91	4.15	308	4.73	.00
	No	69	11.14	4.58			
Depression	Yes	241	11.85	3.01	308	.12	.90
	No	69	11.80	3.43			
Sleep problems.	Yes	241	26.01	5.68	308	3.08	.02
	No	69	23.55	6.11			

A significant difference was noted across post-traumatic stress (t= 3.36, p<.05), anxiety (t= 2.33, p<.05), depression symptoms (t= -3.11 p<.001) and sleep disorders (t= 2.21 p<.05) experienced by earthquake survivors in terms of gender. The findings showed that females experienced higher levels of post-traumatic stress, anxiety, and sleep disorders than men did, while men experienced higher levels of depression symptoms. Table 8 reports on the findings of the analysis.

Table 8

The Relationship between Some Demographic Characteristics regarding Earthquake Survivors and PTSD, Anxiety, Depression and Sleep Problems

Variables	Group	N	$\bar{x}$	sd	df	*t*	*p*
PTSD	Female	148	49.03	15.73	186	3.36	.01
	Male	40	39.40	17.18			
Anxiety	Female	148	14.10	4.20	186	2.33	.02
	Male	40	12.25	5.12			
Depression	Female	148	11.45	3.00	186	-3.11	.00
	Male	40	13.20	5.54			
Sleep problems	Female	148	26.65	5.80	186	2.21	.02
	Male	40	24.35	5.86			

Accordingly, to t-test analyzes, no significant difference was identified across post-traumatic stress (t= -.19, p= .84), anxiety (t= .08, p= .93), depression symptoms (t= .75 p= .45) and sleep disorders (t= .41 p= .68) in terms of earthquake victims' marital status (married/single). On the other, post-traumatic stress (t= 85, p= .39), anxiety (t= 1.36, p= .17), depression symptoms (t= .18, p= .82) and sleep disorder (t= 1.35, p= .17) levels of those who did not experience earthquake did not significantly vary across their gender.

The findings also demonstrated no significant difference between earthquake survivors income (I have low, medium and high level) and their post-traumatic stress ($F_{(2,185)}$= .72, p= .06), anxiety ($F_{(2,185)}$= .54, p= .58), depression symptoms ($F_{(2,185)}$= .89, p= .41), and sleep disorders ($F_{(2,185)}$= .37, p= .69). Likewise, no significant difference was noted across the education level of the earthquake survivors (primary school, high school and university) and the post-traumatic stress experienced after the earthquake ($F_{(2,185)}$= .12, p= .87), anxiety ($F_{(2,185)}$= .35, p= .71), depression symptoms ($F_{(2,185)}$= 1.02, p= .37) and sleep disorders ($F_{(2,185)}$= .58, p= .56).

Discussion

This study is an attempt to explore the post-traumatic stress, anxiety, depression symptoms and sleep disorders experienced by the people who experienced the 6th February earthquake disaster in terms of the earthquake victims/non-victims, residence in the earthquake area, receiving psychological support, moving to a different settlement after the earthquake, and some demographic variables (gender, marital status, perceived income). Besides, the study aims at examining the prevalence levels of post-traumatic stress, anxiety, depression symptoms and sleep disorders in earthquake survivors and investigating the

predictive variables of these problems. Although earthquake studies draw attention in the related literature, the consequences it causes make us think that it is vital to conduct new researches. There is a limited number of studies on post-earthquake psychological mechanisms in Turkey (Aker, 2000; Bıçakcı, & Okumuş 2023; Cengiz & Peker, 2023; Sönmez, 2022; Taşcı & Özsoy, 2021; Uğuz, 2023). These studies differ from our study methodologically (e.g., review). The present study also differs from previous earthquake studies in terms of some variables (receiving psychological support, settling in a different settlement from the earthquake zone). Besides, strong references in the literature regarding further research to improve the understanding of post-earthquake psychological mechanisms (Beaglehole et al., 2019; Khatri et al., 2019; Wang et al. 2000) indicate that this study reveals remarkable results

This study examined the relationships between post-traumatic stress, anxiety, depression and sleep and that medium or high relationship was identified across the variables. Findings (Fan et al., 2011) and the relevant literature (Xi et al., 2020) suggesting that post-traumatic stress disorder, anxiety and depression contain a coordinated structure are in line with the results of the research. These results refer to the methodological power of the research (Cohen, 1994). The relationship between variables was at medium and low levels in terms of people who did not experience earthquakes. However, this study confirmed a negative relationship between depression and post-traumatic stress change. Though these results differ from those of previous studies in terms of level and direction (Kaya & Kaya, 2023; Taşcı & Özsoy, 2021; Xi et al., 2020), there are consistent studies (Özen & Cerit, 2018). The depression (depression, lack of pleasure) criteria (Türkçapar, 2004) and post-traumatic stress diagnosis (re-experiencing, hyperarousal) criteria (Leeds, 2020), the source of the negative relationship between post-traumatic stress and depression may be the result of the magnitude of the disaster. To illustrate, Taşcı and Özsoy (2021) examined Elazığ earthquake that 44 people lost their lives and only one settlement was affected. Likewise, Özen and Cerit (2018) investigated those affected by the Syrian civil war. Because the magnitude or severity of natural disasters may increase the emergence of psychological distress symptoms (Marthoenis et al., 2019). Considering that over 50 thousand people lost their lives in the 6 February 2023 earthquake, it is most likely that depression symptoms will become less noticeable as earthquake survivors pay attention to post-traumatic stress symptoms (e.g. re-experiencing). This can be exemplified as the lowest prevalence of depressive symptoms (12%) in earthquake victims.

The prevalence of post-traumatic stress, anxiety, depression symptoms and sleep disorders among earthquake survivors was 46.8%, 42.6%, 12% and 22.4%, respectively. These results are congruent with those in the literature (Aydın & Kaya, 2021; Beaglehole et al., 2019; Taşcı & Özsoy, 2021 Forresi et al., 2020). While the prevalence of post-traumatic stress was in the range of 30-40% (Neria et al., 2008), this rate was between 50-68% in the Haiti earthquake (Jin et al., 2018). This difference may result from the size of the disaster, the cultural structure, the number of dead people and destroyed buildings, prior traumatic experiences of the people, the level of exposure to the disaster, the time after the disaster or regional sociopolitical practices (Hiller et al., 2016; Marthoenis et al., 2019). That measurement tools have valid cut-off scores may increase the accuracy of the prevalence levels of post-earthquake psychological disorders (Khatri et al., 2019). The use of scales with cut-off points supports the accuracy of our research results. Although the prevalence of anxiety and depressive symptoms was consistent with the results of the meta-analysis (Tang et al., 2014), depression symptoms were found to be less than other variables (sleep disorders). Limited number of studies on major earthquakes was found to analyze sleep disorders (Kemp et al., 2011; Taşcı & Özsoy, 2021). The results of these two studies affirm the prevalence of sleep

disorders. The limited number of earthquake studies on sleep disorders and their high prevalence in our study suggested that sleep may be the predictor variable of post-traumatic stress in earthquake victims. In this vein, the predictive variables of post-traumatic stress experienced by earthquake survivors were determined as anxiety, sleep disorders, and gender.

The results on examining the role of earthquake survivors' anxiety and sleep disorders in predicting post-traumatic stress symptoms suggested that anxiety and sleep were highly significant and positive predictors of post-traumatic stress. The explanatory power of anxiety for PTS was twice that of sleep. Thus, people with a high level of anxiety or a history of anxiety may be more likely to experience post-traumatic stress disorder. Dysfunctional coping strategies (e.g., avoidance, safe behavior) are considered an indicator of post-traumatic stress disorder in the current literature (Su, 2018). Moreover, increased anxiety sensitivity increases the risk of PTSD (Mantar et al., 2010). Depending on the level, fear is considered as a component of post-traumatic stress disorder (Pan et al., 2015). In fact, fear may be the main source of the traumatic event in some cases (Norris et al., 2000). In other words, individuals with high anxiety may be a possible disaster victim. In this line, it may be beneficial to study on risk perception, which reduces anxiety, with those living in areas where there is a possibility of natural disasters such as earthquakes. Perception of risk refers to the subjective assessment of the person or public regarding the characteristics and possible consequences of a possible disaster. Perception of risk allows to seeing the feeling of distress in people, the perceived earthquake results and the possibility of future earthquakes (Slovic, 1999). Hence, earthquake survivors can use functional coping methods against their anxiety-provoking experiences. To exemplify, learning motivation-enhancing tools can be used in schools thanks to Web applications such as emotional preparedness for earthquakes (Raccanello et al., 2020). Practices on earthquake risk perception are powerful methods to prepare for natural disasters (Ao et al., 2021). People with hyperarousal have difficulty falling asleep and staying asleep. People who cannot fall asleep due to hyperarousal may experience nightmares, sleep avoidance (consciously/unconsciously), lack of concentration, and dreaming sensations. Seeing the traumatic event in the first period of the dream and accompanying it with body movements increase the risk of traumatic stress (Mellman et al., 1995). The fact that the literature reports on the relationship between sleep and PTSD and the difference in terms of gender supports the regression result (Harvey et al., 2003). Decreased sleep efficiency, prolongation of the time to fall asleep, increased movements during sleep, and frequent short-term awakenings are considered triggers of hyperarousal (Germain, 2013; Mellman, 1997). All these affirm that people with sleep disorders and a history of anxiety in the disaster area will likely experience post-traumatic stress. Therefore, it is essential to receive early psychological support in order to reduce the PTSD susceptibility of people with sleep disturbances.

The findings showed that earthquake survivors who received psychological support had lower levels of post-traumatic stress, anxiety, depression symptoms and sleep disturbances compared to those who did not. People who experience the traumatic event need psychological support while adapting to life after the traumatic memory (Kahil, 2016; Sönmez, 2022). The current literature proves that psychological help services after traumatic memory are a powerful mechanism in reducing trauma (Shapiro, 2021), meaning that the research result is in conjunction with the literature. In addition, the findings highlighted that post-disaster settlement of earthquake survivors in different regions had no significant effect, indicating the value of receiving psychological assistance services (Yıldız & Akkoyun, 2023). The literature involves different perspectives on the effectiveness of receiving psychological support after an

earthquake (Gerstner et al., 2020). However, the majority of the studies indicated the necessity of social and psychological support (Dai et al., 2016; Marthoenis et al., 2019; Shapiro, 2021). Shapiro's studies are paramount in gaining functionality regarding the traumatic memory (Leeds, 2020). It may be a functional practice to strengthen the social adaptation by providing psychological support in their own regions after the elimination of the factors that pose a risk to the life-threatening dangers after the earthquake. However, several studies reported that relocating earthquake survivors to different settlements results in meaningful effects (Takada et al., 2018). In particular, the duration of the working period (early intervention) of national and local governments after the disaster is emphasized (Kõlves et al., 2013). These differences may be due to the development level of the region affected by the earthquake, social adaptation skills of people, and the effectiveness of the support system of regional or national governments as well as non-governmental organizations (Hiller et al., 2016; Marthoenis et al., 2019). Besides, the difference across psychological disorders may be affected by the use of psychological measurement tools.

This study also examined the relationships between socio-demographic variables and research variables. In this context, a significant difference was noted across the post-traumatic stress, anxiety and sleep disorders experienced by earthquake survivors in terms of gender. While females were determined to have higher levels of post-traumatic stress, anxiety and sleep disturbance, men had more depression symptoms. This is consistent with the related literature (Cénat et al., 2020; Dai et al., 2016; Forresi et al., 2020; Tang et al., 2014). It is claimed that being a woman increases the risk of developing PTSD (Feo et al., 2014; Sharma & Kar, 2018). However, there are no consistent results for depression symptoms. Zang et al. (2011) found no relationship between depression and gender. Pan et al. (2015) pointed out a weak relationship between depression and gender. Various meta-analysis studies demonstrated that the level of being affected by the earthquake or returning to normal life differed across culture (Cénat et al., 2020; Dai et al., 2016). Unlike the literature, more depression symptoms in males may be explained within the context of cultural and social duties. For example, the roles of men (e.g., father) may differ in terms of gender roles in Turkish culture (Ökten, 2009).

Research findings revealed no significant difference between the marital status of earthquake survivors and post-traumatic stress, anxiety and sleep disorders. There is no study specifically published on investigating the relationship between being married/single and psychological disorders. Political or cultural differences (Norenzayan, 2010) and gender roles regarding marriage in Turkey (Ökten, 2009) may be the factors for analyzing the marital status of earthquake survivors. In Turkey, Taşcı and Özsoy included these variables in the personal information form, yet they did not make analysis on marital status. In a study conducted with pregnant women, being single and having low relationship quality were identified as possible risk factors for post-traumatic psychological disorders (Fisher et al., 2012). Married earthquake survivors are expected to experience more stress and anxiety due to the obligations of being married and possible losses. Finally, yet importantly, the present study explored whether earthquake survivors' psychological disorders varied across their education level and income perception (I have low-middle-high income); accordingly, no significant difference was noted across their post-traumatic stress, anxiety and sleep disorders in terms of their education level and income perception. No studies have been conducted on understanding the psychological disorders experienced after the earthquake in terms of these variables. On the other, low education level, low income level, low social support and life stress are considered as risk factors for post-traumatic stress (Fisher et al., 2012).

As a result, approximately half of the earthquake victims experienced post-traumatic stress reactions accompanied by symptoms of anxiety, sleep disturbance and depression. Anxiety attitudes and sleep behaviors predict the post-traumatic stress experienced by earthquake survivors. Psychological support services received in the early period after natural disasters reduce the incidence of post-traumatic stress, anxiety, depression and sleep disorders. Gender is a risk factor for post-earthquake psychological disorders. Besides, leaving the area where disaster victims live after the earthquake did not contribute significantly to their psychological well-being. The research results are in line with those in the literature (Kahil, 2016). Despite significant results, the study has some limitations. Relational survey studies do not provide in-depth information about how psychological disorders change. In addition, it is not possible to make inferences between variables and thus leading to failure in understanding the change in psychological disorders. Therefore, further research (e.g., longitudinal) may be conducted on earthquakes. Although the psychological measurement tools used in the study were prepared to identify psychological disorders and have satisfactory reliability values, it is important to conduct clinical interviews with earthquake victims (e.g., SCID interview) to confirm the data. As the participants' level of psychological discomfort before the earthquake is unknown, generalizations about the prevalence cannot be made. This study was carried out approximately 5 months after the earthquake. Considering the reduction of post-traumatic stress over time (Hiller et al., 2016), it would be valuable to conduct further studies on the Turkish sample in different periods. Our study also has many strengths. It is the first relational survey study with a large sample after the biggest earthquake in Turkey (6 February 2023 earthquake). In addition, the study is valuable in terms of examining the prevalence rates of PTSD, depression and anxiety after the earthquake and revealing the prevalence of post-traumatic stress. This study also increases the understanding of post-traumatic stress and anxiety, sleep behaviors, psychological help and other psychosocial mechanisms. Thus, the results may help NGOs and policy makers in the disaster preparedness process and contribute to mental health professionals in understanding the psychological health status of disaster survivors to develop appropriate interventions (e.g., psychological first aid). Besides, the findings could offer earthquake victims valuable insights into their post-earthquake experiences.

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