*Research Article / Araştırma Makalesi*

# Investigation of Suicide Attempt, Impulsivity, Psychological Pain and Depression in Earthquake Survivors Affected by the February 6, 2023 Kahramanmaraş Centered Earthquake

## 6 Şubat 2023 Kahramanmaraş Merkezli Depremlerden Etkilenen Depremzedelerde İntihar Girişimi, Dürtüsellik, Psikolojik Acı ve Depresyonun Araştırılması

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**Abstract**

**Background:** The aim of this study was to investigate the levels of impulsivity, psychological pain, depression and anxiety that predict being in the suicide attempt group among earthquake survivors affected by the Kahramanmaraş earthquake on February 6, 2023.
**Materials and Methods:** Between August 2023 and February 2024, 36 earthquake survivors who attempted suicide were selected to be included in a case group at a psychiatric clinic. Simultaneously, a control group of 36 earthquake survivors, who had not received a psychiatric diagnosis and were matched with the case group in terms of age and gender, was formed. Subsequently, each earthquake survivors fulfilled a semi-structured sociodemographic and clinical data form, the Beck Depression Inventory (BDI), the Beck Anxiety Inventory (BAI), the Psychache Scale (PS), and the Barratt Impulsiveness Scale (BIS).
**Results:** 63.9% of the patients who attempted suicide were females. Individuals in the case group experienced more loss of relatives in the earthquake than the control group (p=0.002). In the case group, there was a positive correlation between the non-planning subscale and BDI and PS (r=0.691, p<0.001, r= 0.370 p=0.026, respectively). When analyzed in terms of whether the suicide act was related to the earthquake or not, there was less suicide history and method difference in the cases of earthquake-related suicide (p=0.006, p=0.029, respectively). According to logistic regression analysis, high psychological pain symptom severity predicts that earthquake survivors are in the group with a history of suicide attempt (OR=1.50, 95% CI: 1.17-1.94, p=0.01).
**Conclusions:** Post-earthquake survivors with symptoms of depression, impulsivity, anxiety and psychological pain should be closely monitored for suicide risk and psychosocial interventions should be provided.

**Keywords:** Depression, Earthquake, Impulsivity, Suicide, Psychache

**Öz**

**Amaç**: 6 Şubat 2023 tarihli Kahramanmaraş merkezli depremlerden etkilenen depremzedelerden intihar girişimi olan grupta bulunmayı öngören dürtüsellik, psikolojik acı, depresyon ve anksiyete düzeylerini incelemekti.
**Materyal ve Metod:** Ağustos 2023 ile Şubat 2024 arasında, intihar girişiminde bulunan 36 depremzede, bir psikiyatri kliniğinde vaka grubuna dahil edilmek üzere seçildi. Aynı zamanda, vaka grubu ile yaş ve cinsiyet açısından eşleştirilen ve psikiyatrik tanı almamış 36 depremzeden oluşan bir kontrol grubu oluşturuldu. Devamında her bir depremzede yarı yapılandırılmış sosyodemografik ve klinik veri formu, Beck Depresyon Ölçeği (BDÖ), Beck Anksiyete Ölçeği (BAÖ), Psikolojik Acı Ölçeği (PAÖ) ve Barratt Dürtüsellik Ölçeğini (BDÖ) doldurdu.
**Bulgular:** İntihar girişiminde bulunan hastaların %63.9'u kadındı. Vaka grubundaki bireyler, kontrol grubuna göre depremde daha fazla akraba kaybı yaşadı (p=0,002). Vaka grubunda, plan yapmama alt ölçeği ile BDÖ ve PAÖ arasında pozitif bir korelasyon vardı (sırasıyla r=0,691, p<0,001, r=0,370 p=0,026). İntihar eyleminin depremle ilgili olup olmadığı açısından analiz edildiğinde, depremle ilgili intiharlarda daha az intihar geçmişi ve yöntem farkı olduğu gözlemlendi (sırasıyla p=0,006, p=0,029). Lojistik regresyon analizine göre, yüksek PAÖ şiddeti, depremzedelerin intihar girişimi geçmişine sahip olma grubunda yer alacağını öngörmektedir (OR = 1,50, %95 CI: 1,17-1,94, p=0,01).
**Sonuç:** Depresyon, dürtüsellik, anksiyete ve psikolojik acı belirtileri gösteren deprem sonrası hayatta kalanlar, intihar riski açısından yakından izlenmeli ve psikososyal müdahaleler sağlanmalıdır.

**Anahtar Kelimeler:** Depresyon, Deprem, Dürtüsellik, İntihar, Psikolojik acı

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## Introduction

On February 6, 2023, two major and destructive earthquakes occurred on the same day in Kahramanmaraş Province. In addition to the loss of their relatives, earthquake survivors exposed to these devastating earthquakes were exposed to challenging post-disaster stressors such as shelter and nutrition (1). Earthquakes are known to cause mental distress (2). These mental problems can be directly driven by fear or by mental and behavioral disorders that develop after the trauma (3). In a study, posttraumatic stress disorder was diagnosed in 13.1%, anxiety disorder in 37.3% and depression in 19.8% of people who experienced an earthquake (4). In addition to these, suicidal tendencies may occur in disaster survivors after the earthquake (5-7). Some studies have shown that non-fatal suicides decrease immediately after particularly damaging earthquakes but suicides increase in the long term after the earthquake (8).

The World Health Organisation reports that more than 800,000 people die by suicide each year (9). Suicide can be analyzed in two categories: "suicide" and "suicide attempt". Suicide attempts are attempts to kill or harm oneself voluntarily that do not result in death (10). The prevalence of suicidal ideation after the earthquake was found to be 20.34% (11). It is known that people who attempt suicide are more impulsive (12). It has been reported that the inability to control aggressive impulses affects the risk of impulsive suicide attempts more than depression (13). Anxiety and depression symptoms are risk factors for the onset of suicidal ideation and suicide attempts (14). It has been said that without psychological pain, equivalent to negative inner experiences such as fear, helplessness and loneliness, suicidal intentions and behavior would not exist (15). The relationship between suicidal ideation and psychological pain in depression is thought to be (16). When psychological pain reaches a high level, and no change can be foreseen in the future, the person may prefer to get rid of psychological pain by ending their life (17). Although there are many studies examining the psychological states of people who have experienced an earthquake (18, 19), studies evaluating suicide attempts in earthquake survivors and the psychological states of these people are limited.

Based on the information provided above, it has been suggested that the severity of depression, anxiety, impulsivity, and psychological pain symptoms in earthquake survivors who attempted suicide may be higher compared to the control group. As a second hypothesis, we expected to find a significant difference in the methods of suicide among individuals who have attempted suicide, depending on whether the suicide attempt was related to the earthquake. The aim of our study is to compare the sociodemographic data, levels of impulsivity, depression, anxiety, and psychological pain between earthquake survivors who have attempted suicide and those without any psychiatric disorders, matched by age and gender. Additionally, it aims to examine the methods of suicide among earthquake survivors who have attempted suicide, based on whether or not the attempt was related to the earthquake. We think that determining this situation may be helpful for the recognition of individuals who have experienced a disaster and who are at risk of suicide and for the psychosocial support to be provided.

## Materials and Methods

### *Participants*

Case group: 36 people with suicide attempts who applied to the psychiatry clinic of Adiyaman Training and Research hospital between August 2023 and February 2024 after the Kahramanmaras earthquakes and who met the study criteria were included. The study included voluntary participants over the age of 18 who had attempted suicide, provided they had no significant physical pathology or neurological disorders (such as epilepsy or cerebrovascular events), no history of head trauma, and no cognitive impairment that could affect the distribution of psychiatric symptoms. Individuals with mental illnesses such as schizophrenia and intellectual disability were excluded from the study. The case group was divided into two subgroups based on whether their suicide attempts were related to the earthquake or not. The control group consisted of 36 earthquake survivors without psychiatric disorders, matched to the case group in terms of age and gender, who presented to the medical board of [name blinded for peer review] hospital between August 2023 and February 2024. Participants underwent structured interviews according to the American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), which lasted approximately 30 minutes. The study did not include people who could not answer the questions, were illiterate, had impaired hearing and speech, or were not between the ages of 18 and 65. Seven patients with suicide attempts and two people from the healthy control group were excluded from the study because they filled the scale questions incompletely.

### *Procedure*

The local ethics committee approval of our cross-sectional prospective study was obtained by the Fırat University Non-Interventional Ethics Committee on 27.09.2023 with the number 2023/13-48. This study followed the ethical standards of the Declaration of Helsinki, 2013 revision. G*Power 3.1.9.2 program was used to calculate the sample of the research, and it was estimated that a total of 72 participants, including at least 36 patients with suicide attempts and 36 control groups, should be reached with 95% power and 5% margin of error. Informed consent was obtained from all participants who participated in the study. After informed consent was received, the measurement tools were randomly distributed to the participants to control for the ordering effect of scale administration.

### *Measures*

Sociodemographic and clinical data forms, Psychache Scale, Beck Depression Inventory, Beck Anxiety Inventory, and Barratt Impulsivity Scale, were completed for all participants.

***Sociodemographic and Clinical Data Form:*** A sociodemographic and clinical data form was prepared following the clinical experience, the information obtained from the reviewed sources and considering the study's aims. Sociodemographic data such as age, gender, marital status, educational status, and clinical data such as history of psychiatric treatment, duration of mental illness, presence of grief in the earthquake and method of suicide attempt were recorded. It was also questioned whether the cause of suicide was related to the earthquake or any consequences of the earthquake.

***Beck Depression Inventory (BDI):*** It measures the level and severity of depressive symptoms. It consists of 21 items in total. Each item receives an increasing Likert-type score between 0-3, and the total score is obtained by summing them. Turkish validity and reliability studies were conducted (20, 21). Cronbach's alpha value was determined as 0.73 for this study.

***Beck Anxiety Inventory (BAI):*** It is a self-assessment scale used to determine the frequency of anxiety symptoms experienced by individuals. It is a Likert-type scale comprising 21 items and scored between 0-3. Its validity and reliability have been performed in Türkiye (22, 23). Cronbach's alpha value was determined as 0.74 for this study.

***Psychache Scale (PS):*** It is structured on Shneidman's definition of chronic, free-floating, non-situation-specific psychological pain resulting from unmet vital psychological needs. The PS was developed to investigate the relationship between psychological pain and suicidality. The PS shows the frequency of psychological pain rather than its severity (24). Turkish validity and reliability have been performed (25). Cronbach's alpha value was determined as 0.97 for this study.

***Barratt Impulsivity Scale (BIS):*** The 11th version of the Barratt Impulsivity Scale (BIS-11) was developed in 1995 (26). It is frequently used to measure impulsivity. It consists of 30 items and has three subgroups: non-planning, attentional and motor impulsiveness. The Turkish validity and reliability of this scale were performed by Gulec et al (27).

***Data analysis***

The analyses were performed using the SPSS (Statistical Package for Social Sciences; SPSS Inc., Chicago, IL) 22 package program. Descriptive data were presented as n, % values for categorical data and mean±standard deviation and median interquartile range (25-75 percentile values) for continuous data. Chi-square analysis (Pearson Chi-square) was used to compare categorical variables between groups. The suitability of continuous variables for normal distribution was evaluated by Kolmogorov-Smirnov test. Mann-Whitney U-test was used to compare the paired groups. The Spearman correlation test was used to analyze the relationship between continuous variables. Cramer V coefficient for chi-square analysis and rank-biserial correlation coefficient (r) coefficient for Mann Whitney U test were used to calculate effect size. Logistic regression analysis (Enter method) was used to identify the data that predicted suicide attempt. The statistical significance level was accepted as $p<0.05$ in the analyses.

## Results

A total of 72 participants, including 36 suicide attempters and 36 controls, were included in the study. The mean age of the case group was 31.6±12.4 years; 63.9% (n=23) were between 18-30 years, 16.7% (n=6) were between 31-40 years and 19.4% (n=7) were over 40 years. The mean age of those in the control group was 30.4±7.5; 58.3% (n=21) were between 18-30 years, 33.3% (n=12) were between 31-40 years and 8.3% (n=3) were over 40 years. The rate of loss of relatives in the case group (86.1%) was significantly higher than the rate in the control group (52.8%) ($p=0.002$). In the case group, 36.1% (n=13) were currently using psychiatric medication, 58.3% (n=21) had received psychiatric treatment before, 50% (n=18) had a history of suicide, and 44.4% (n=16) had a history of self-mutilation but not in the control group (Table 1).

All scale scores of the case group were significantly higher than those of the control group ($p<0.001$) (Table 2).

In the case group, there was a strong positive relationship between non-planning impulsivity and the following factors: motor impulsivity, attentional impulsivity, BAI, BDI, and PS ($r=0.33$, $p=0.046$; $r=0.55$, $p<0.001$; $r=0.64$, $p<0.001$; $r=0.58$, $p<0.001$ and $r=0.37$, $p=0.026$, respectively). There was a significant positive correlation between motor impulsivity and the following: attentional impulsivity, BAI and PS ($r=0.58$, $p<0.001$; $r=0.39$, $p=0.018$ and $r=0.42$, $p=0.011$, respectively). A significant positive correlation existed between attentional impulsiveness and the following: BAI, BDI and PS ($r=0.48$, $p=0.003$; $r=0.48$, $p=0.003$ and $r=0.38$, $p=0.022$, respectively). There was a significant positive correlation between BIS and BAI ($r=0.54$, $p=0.001$), and the following factors: BDI and PS ($r=0.71$, $p<0.001$). There was a significant positive correlation between BAI and the following: BDI ($r=0.73$, $p<0.001$) and PS ($r=0.73$, $p<0.001$). A significant positive correlation was observed between BDI and PS ($r=0.71$, $p<0.001$) (Table 3). No significant difference was observed between the status of being related to the earthquake in terms of scale scores ($p>0.05$).

While 50% (n=7) of those with earthquake-related suicide attempted suicide by abusing drugs/toxic substances, 21.4% (n=3) attempted suicide with a cutting instrument, 7.1% (n=1) attempted suicide by hanging, and 21.4% (n=3) jumped from a height. In the non-earthquake-related group, 63.6% (n=14) attempted suicide by drinking drugs/toxic substances, 13.6% (n=3) attempted suicide with a cutting instrument, 4.5% (n=1) attempted suicide by hanging, 13.6% (n=3) attempted suicide with a firearm and 4.5% (n=1) attempted suicide by jumping from a height. A significant difference was observed between the relationship with the earthquake regarding the method ($p=0.029$). The rate of suicide history in earthquake-related suicides (21.4%) was significantly lower than the rate of suicide history among non-earthquake-related suicides (68.2%) ($p=0.006$) (Table 4).

According to the logistic regression analysis conducted to examine the prediction of being in the group with a history of suicide attempt, losing a relative in an earthquake and having high scale scores constitute a risk ($R2=0.941$, $F=88.160$, $p<0.001$) (Table 5).

**Table 1.** Comparison of all characteristics of the groups

| | | Case | | Control | | Effect size | p* |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | | |
| **Gender** | Woman | 23 | 63.9 | 23 | 63.9 | 0.000 | 1.000 |
| | Man | 13 | 36.1 | 13 | 36.1 | | |
| **Age group** | 18-30 | 23 | 63.9 | 21 | 58.3 | 0.226 | 0.158 |
| | 31-40 | 6 | 16.7 | 12 | 33.3 | | |
| | >40 | 7 | 19.4 | 3 | 8.3 | | |
| **Marital status** | Single | 17 | 47.2 | 18 | 50.0 | 0.165 | 0.375 |
| | Married | 12 | 33.3 | 15 | 41.7 | | |
| | Divorced | 7 | 19.4 | 3 | 8.3 | | |
| **Education status** | Primary education | 16 | 44.4 | 14 | 38.9 | 0.222 | 0.168 |
| | High School | 9 | 25.0 | 16 | 44.4 | | |
| | University | 11 | 30.6 | 6 | 16.7 | | |
| **Current use of psychiatric medication** | Yes | 13 | 36.1 | 0 | 0 | 0.469 | **<0.001** |
| | No | 23 | 63.9 | 36 | 100.0 | | |
| **Previous history of psychiatric treatment** | Yes | 21 | 58.3 | 0 | 0 | 0.642 | **<0.001** |
| | No | 15 | 41.7 | 36 | 100.0 | | |
| **Duration of psychiatric illness** | <5 year | 14 | 38.9 | 0 | 0 | 0.599 | **<0.001** |
| | 5-10 year | 3 | 8.3 | 0 | 0 | | |
| | >10 year | 2 | 5.6 | 0 | 0 | | |
| | No psychiatric follow-up | 17 | 47.2 | 36 | 100.0 | | |
| **Loss of relatives/friends in earthquake** | Yes | 31 | 86.1 | 19 | 52.8 | 0.362 | **0.002** |
| | No | 5 | 13.9 | 17 | 47.2 | | |
| **Presence of being trapped under debris** | Yes | 5 | 13.9 | 1 | 2.8 | 0.201 | 0.199 |
| | No | 31 | 86.1 | 35 | 97.2 | | |
| **Suicide history** | Yes | 18 | 50.0 | 0 | 0 | 0.577 | **<0.001** |
| | No | 18 | 50.0 | 36 | 100.0 | | |
| **Self-mutilation history** | Yes | 16 | 44.4 | 0 | 0 | 0.535 | **<0.001** |
| | No | 20 | 55.6 | 36 | 100.0 | | |
| **Method of suicide attempt** | Drinking medication/toxic substances | 21 | 58.3 | - | | - | - |
| | Suicide with a cutting instrument | 6 | 16.7 | | | | |
| | Suicidal hanging attempt | 2 | 5.6 | | | | |
| | Suicide attempt with firearm | 3 | 8.3 | | | | |
| | Jumping from a height | 4 | 11.1 | | | | |
| **Suicide in relation to earthquake** | Yes | 14 | 38.9 | - | | - | - |
| | No | 22 | 61.1 | | | | |

**Chi-square analysis was applied.*

**Table 2.** Comparison of the scale scores of the groups

| | Case | Control | Effect size | p* |
|---|---|---|---|---|
| | **Median (IQR)** | **Median (IQR)** | | |
| **Non-planning** | 13.0 (11.0-16.0) | 6.0 (5.0-7.0) | 0.800 | <0.001 |
| **Motor impulsiveness** | 10.0 (8.0-12.5) | 7.0 (6.0-8.0) | 0.596 | <0.001 |
| **Attentional impulsiveness** | 11.0 (8.0-13.5) | 7.0 (5.0-8.0) | 0.553 | <0.001 |
| **BIS** | 35.0 (29.0-40.5) | 19.5 (18.0-24.0) | 0.725 | <0.001 |
| **BAI** | 28.0 (19.0-40.0) | 2.0 (0-4.0) | 0.822 | <0.001 |
| **BDI** | 39.0 (25.5-46.0) | 2.0 (0-3.5) | 0.849 | <0.001 |
| **PS** | 39.5 (26.0-46.5) | 0 (0-1.5) | 0.859 | <0.001 |

**Mann Whitney U test was applied. BIS: Barratt Impulsive Scale, BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, PS: Psychache Scale*

**Table 3.** Correlation of scale scores in the case group

| | | Non-planning | Motor impulsiveness | Attentional impulsiveness | BIS | BAI | BDI |
|---|---|---|---|---|---|---|---|
| **Motor impulsiveness** | r | 0.334 | | | | | |
| | p | 0.046 | | | | | |
| **Attentional impulsiveness** | r | 0.553 | 0.577 | | | | |
| | p | <0.001 | <0.001 | | | | |
| **BIS** | r | 0.691 | 0.784 | 0.900 | | | |
| | p | <0.001 | <0.001 | <0.001 | | | |
| **BAI** | r | 0.644 | 0.391 | 0.477 | 0.545 | | |
| | p | <0.001 | 0.018 | 0.003 | 0.001 | | |
| **BDI** | r | 0.582 | 0.255 | 0.485 | 0.479 | 0.733 | |
| | p | <0.001 | 0.133 | 0.003 | 0.003 | <0.001 | |
| **PS** | r | 0.370 | 0.421 | 0.381 | 0.444 | 0.734 | 0.715 |
| | p | 0.026 | 0.011 | 0.022 | 0.007 | <0.001 | <0.001 |

*BIS: Barratt Impulsive Scale, BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, PS: Psychache Scale*

**Table 4.** Comparison of suicide method and history of suicide attempt according to suicide being related to earthquake

| | | Earthquake-related | | Not related to the earthquake | | Effect size | p* |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | | |
| **Method of suicide attempt** | Drinking medication/toxic substances | 7 | 50.0 | 14 | 63.6 | 0.480 | 0.029 |
| | Suicide with a cutting instrument | 3 | 21.4 | 3 | 13.6 | | |
| | Suicidal hanging attempt | 1 | 7.1 | 1 | 4.5 | | |
| | Suicide attempt with firearm | 0 | 0 | 3 | 13.6 | | |
| | Jumping from a height | 3 | 21.4 | 1 | 4.5 | | |
| **Suicide history** | Yes | 3 | 21.4 | 15 | 68.2 | 0.456 | 0.006 |
| | No | 11 | 78.6 | 7 | 31.8 | | |

**Chi-square analysis was applied.*

**Table 5.** Logistic regression analysis of data predicting suicide attempt

| $R^2$=0.941, F=88.160, p<0.001 | B | p | OR | 95% GA |
|---|---|---|---|---|
| **BIS** | 0.287 | <0.001 | 1.333 | 1.176-1.510 |
| **BAI** | 0.370 | <0.001 | 1.447 | 1.188-1.763 |
| **BDI** | 0.460 | 0.004 | 1.583 | 1.161-2.160 |
| **PS** | 0.411 | 0.001 | 1.509 | 1.172-1.942 |
| **Loss of relatives/friends in earthquake** (ref: No loss of relatives/friends in the earthquake | 1.713 | 0.003 | 5.547 | 1.758-17.503 |

*BIS: Barratt Impulsive Scale, BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, PS: Psychache Scale*

## Discussion

This study aims to compare the sociodemographic characteristics, impulsivity, depression, anxiety, and levels of psychological pain between earthquake survivors who have attempted suicide and those without any psychiatric disorders. Individuals who attempted suicide experienced more loss of family members or friends after the earthquake compared to the control group. According to the findings of the present study earthquake survivors who have attempted suicide may exhibit higher levels of depression, anxiety, impulsivity, and psychological pain symptoms compared to those who have not. Furthermore, in individuals who survived the earthquake, higher scores on the BIS, BAI, BDI, and PS, as well as the loss of relatives or friends during the earthquake, are predictive of suicide attempts. Among individuals who attempted suicide, those whose reason for suicide is related to the earthquake were observed to be more likely to prefer the method of jumping from a height compared to those whose reason was unrelated to the earthquake. Overall, these findings provide a new understanding of suicide attempts following earthquakes and offer a general overview of the factors that drive earthquake survivors to suicidal behavior.

In the present study, 63.9% of the individuals who attempted suicide were in the 18-30 age group, and the number of female cases is approximately twice that of male cases. Following natural disasters, suicide rates show different trends according to gender (28). In a study conducted after the Great East Japan earthquake, it has been found that the earthquake disaster decreases the suicide rates of men whilst not having any effect on the suicide rates of women. It is thought that political and economic conditions in developed countries such as Japan may have provided a safety net for men and thus prevented suicide (29). After the L'Aquila earthquake, it has been found that the prevalence of suicidal ideation in women was higher than that of men (30); on the contrary, suicidal ideation of male students is higher than

that of female students after the Marmara earthquake (31). In a review similar to our research, it has been reported that the female gender is an essential factor affecting the suicide rate after natural disasters. It has been thought that violence against women, increasing poverty, and not having adequate nutrition and safe housing conditions may be the reasons for this situation (32). In a study conducted after the 1995 Great Hanshin-Awaji earthquake, it has been observed that middle-aged men were the group most affected by suicide, especially during the two years following the earthquake (33). Another study have found that elderly and young individuals constitute the vulnerable group in the face of suicide after a disaster. It is thought that the need for help with daily activities in older people, the loss of family and social support, and poor life skills in young people contribute to this situation (34). However, another study conducted after a flood disaster suggests that older individuals are more resilient to psychological trauma compared to younger individuals because they use religious coping strategies (35). In the region where the present study is conducted, it is believed that older individuals may have used religious coping strategies more effectively than younger individuals in dealing with post-earthquake stress, and this may have contributed to the lower number of suicide cases among the elderly.

In the present study, suicide cases in the case group have lost more relatives in the earthquake than the control group. Furthermore, the regression analysis indicates that the experience of losing loved ones in the earthquake is a significant predictor of suicide attempts. After earthquakes, survivors may have been injured or lost family members, friends, or jobs (34). After the 1999 Taiwan earthquake, it has been reported that the likelihood of suicide is 1.46 times higher in individuals in the disaster area compared to non-earthquake survivors (36). Previous literature shows that the loss of a spouse has an OR effect of 3.91 for women and 4.09 for men on suicide (37). Loss of a first-degree relative causes long-term changes in daily life, financial losses and disruptions in social networks (38). It has been thought that the loss of social support and the complicated grief process, in addition to the loss of a loved one, may have facilitated the suicide attempt.

Continuous exposure of the people of the region to negative enviromental and social factors after disasters may lead to an increase in mental disorders in individuals (39). In a study conducted on survivors eight years after the Wenchuan earthquake, it has been found that posttraumatic stress disorder, depression and suicidal ideation are higher in individuals with physical disability and impaired social communication after the earthquake (34). Brown et al. (40) have revealed in their study that individuals with mental disorders before disasters are more likely to experience suicidal ideation and attempts after the disaster. Similarly, in the present research, it has been found that the history of psychiatric illness and treatment is higher in the case group than in the control group. The relationship between depression and suicidal ideation has been consistently demonstrated in World Health Organisation (WHO) studies. However, WHO studies do not predict suicide attempts in a manner consistent with suicidal ideation (41). A study following adolescents in China for 18 months in terms of suicidal ideation after an earthquake found depression to be the strongest predictor of suicide after natural disasters (42). Similarly, in the present study, a high BDI scale score increases the likelihood of being in the group with a history of suicide attempt. The fact that the BDI mean scores of the individuals in the case group are significantly higher than the control group and the high specificity and sensitivity rates of the BDI are significant in determining suicide. In conclusion, close psychological follow-up and treatment of individuals with a history of depression after the earthquake disaster, i.e. diagnosed individuals, and the measures that can be taken in this regard are critical in preventing suicide.

Impulsivity is an essential component of suicidal behavior (43). In a study conducted on individuals with depression, it has been shown that there is a correlation between the severity of depressive symptoms and the scores on the BIS non-planning subscale (44). In the present study, it has been observed that the BIS non-planning subscale is more specific than motor and attentional impulsiveness. It has been found that the BIS non-planning subscale correlates more with the BDI than the motor and attentional impulsiveness subscales. High BIS non-planning scores may be associated with depressed mood rather than increased impulsivity. Studies conducted after the earthquake suggest that behaviors such as self-harm and suicide show impulsivity, and these behaviors are thought to occur as a symptom of posttraumatic stress disorder (45, 46). Although posttraumatic stress disorder is not examined in this study, it has been suggested that post-earthquake anxiety may increase the risk for suicidal ideation. A meta-analysis study have found that continued exposure to traumatic stimuli after the earthquake lead to an increase in anxiety and other mental disorders (39). Similarly, in the present study, the fact that individuals with more impulsivity and anxiety disorders after the earthquake are included in the group with a history of suicide attempts shows us the destructive psychological impact of earthquake trauma. However, according to Gray's theory, anxiety and impulsivity are opposite drivers. Highly anxious individuals tend to avoid punishment; thus, this tendency prevents suicidal ideation (47). However, in this study, we think that the association of BAI with BIS are the results of examining individuals with suicide attempts rather than suicidal ideation after a devastating disaster.

Suicide is an impulsive decision taken by an individual as a result of overwhelming anger aimed at eliminating psychological pain. Increased impulsivity and psychological pain play a mediating role not only in suicidal behavior but also in suicidal ideation (48). In this study, PS is positively correlated with BDI, BIS and BAI, and psychological pain is a factor that facilitates being in the suicide attempt group. Similar to the results of the present study, Levi et al. (49) have found that the mental anguish levels of suicide attempt cases are higher

than healthy controls. Impulsive people show more painful and provoking behavior in their lives and consequently have a higher ability to commit suicide than the general population. Genetic and environmental factors contribute to the fearless superiority characteristics of the individual (50). In the present study, although there is no statistically significant difference between the BIS subscale scores of earthquake-related and non-earthquake-related suicides, It has been found that the BIS subscale scores of non-earthquake-related suicide attempts are higher. At the same time, it has been observed that individuals who attempted suicide due to earthquake-related problems have less history of suicide attempts. Although the study conducted after the Kobe earthquake (51) it has been thought that the decrease in suicide cases is because there are no buildings for jumping from heights, on the contrary, Yang et al (38). have pointed out that jumping from a height, the least used suicide method is preferred. In the present study, It has been found that individuals who committed earthquake-related suicide preferred jumping from a height more than those who did not. The fact that our cases consist of incomplete suicide attempts may suggest that these individuals are making a cry for help by using the method of jumping from a height. It has been thought that our results are essential in recognizing individuals with suicidal tendencies after earthquakes and planning the necessary interventions.

***Strengths and Limitations***

The most striking finding of our study is that there is a significant difference between earthquake-related and non-earthquake-related suicide attempts in terms of suicide methods in the study group. In addition, it is quite remarkable that there is less suicide history among the individuals who attempted suicide related to the earthquake. There are some limitations of our study. Firstly, since our study is cross-sectional, we cannot clearly define the causal relationships between sociodemographic data, impulsivity, depression, anxiety, psychological pain and suicide. The role of these variables in suicide needs to be confirmed by longitudinal studies. Second, our sample size does not include all cities affected by the earthquake. More long-term studies are needed in the future to understand the effect of the time elapsed since the earthquake on suicide. At the same time, we think that the comparison of the clinical features of suicide cases from the disaster area with suicide cases not from the disaster area in future studies will contribute to the literature. Despite all limitations, analyzing the suicide cases in the disaster area in terms of the relationship between the cause of suicide and the earthquake is the most substantial aspect of our study.

## Conclusion

To conclude, our case group who survived the earthquakes and attempted suicide between six months and one year after the earthquakes, have higher levels of depression, anxiety and psychological pain and are more impulsive than the control group consisting of earthquake survivors of the same age and gender. High levels of impulsivity, depression, anxiety and psychological pain symptoms in earthquake survivors make it easier to be included in the group with a history of suicide attempt. In addition, it is observed that the case group, who attempted suicide, related to the earthquake did not have a history of suicide attempts, and indicated a more significant preferance for jumping from a height as a suicide method. Our results show that the measures to be taken should be directed toward recognizing risky groups rather than the general population in the earthquake zone.

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