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Predictors and Mediators of Sleep Quality After Multiple Consecutive Devastating Earthquakes in Türkiye

Türkiye'de Art Arda Yaşanan Yıkıcı Depremler Sonrası Uyku Kalitesinin Belirleyicileri ve Aracı Faktörleri

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Abstract

Objective: The aim of this study is to determine the prevalence of insomnia and the level of sleep quality in the first month of earthquakes in Kahramanmaraş and to investigate the effects of earthquake stress coping strategies on sleep quality and insomnia.

Materials and Methods: This cross-sectional study included 509 adults in Adana. Sleep problems were assessed with the Insomnia Severity Index and Pittsburgh Sleep Quality Index (PSQI), and the coping level with earthquake stress with the Coping with Earthquake Stress Scale (CESS).

Results: The mean age of the individuals was 29.42±12.62 years and 73.1% were female. After the earthquake, 64% of the participants had decreased sleep duration, 66.8% had increased night awakenings, 77.6% had difficulty falling asleep, and 7.3% started to use sleeping pills to sleep. All participants had poor sleep quality; 26.1% had moderate insomnia and 8.1% had clinical insomnia. After the earthquake, the risk of moderate and clinical insomnia was found to be increased Odds ratio (OR)=2.33 times in the 18-40 age group, OR=2.07 times in females, OR=1.88 times in those with children, and OR=2.29 times in people with previous sleep disorders. The use of the positive reappraisal strategy improved sleep quality, and each unit increase in this sub-dimension of CESS caused a 0.137-unit decrease in the PSQI score. Coping strategies contributed to the improvement of sleep quality both directly and indirectly by reducing insomnia.

Conclusion: Sleep problems were common in the subacute period after the earthquake. We recommend interventions to develop positive reappraisal strategies for groups vulnerable to sleep problems.

Keywords: Insomnia, earthquakes, sleep quality

Öz

Amaç: Bu çalışmanın amacı Kahramanmaraş merkezli depremlerin birinci ayında uykusuzluk prevalansını ve uyku kalitesi düzeyini saptamak, deprem stresi ile başetme stratejilerinin uyku kalitesi ve uykusuzluk üzerindeki etkisini araştırmaktır.

Gereç ve Yöntem: Bu kesitsel çalışma Adana'da 509 yetişkin üzerinde yürütülmüştür. Uyku sorunlarını değerlendirmek için Uykusuzluk Şiddet İndeksi ve Pittsburgh Uyku Kalitesi İndeksi (PSQI) kullanılmış ve deprem stresiyle başa çıkma düzeyi Deprem Stresiyle Başa Çıkma Ölçeği (CESS) ile değerlendirilmiştir.

Bulgular: Bireylerin yaş ortalaması 29,42±12,62 yıl olup, %73,1'i kadındır. Depremden sonra katılımcıların %64'ünün uyku süresi azalmış, %66,8'inin gece uyanmaları artmış, %77,6'sı uykuya dalmakta güçlük çekmiş ve %7,3'ü uyumak için uyku ilacı kullanmaya başlamıştır. Katılımcıların tamamının uyku kalitesi düşüktür; %26,1'inde orta derecede uykusuzluk ve %8,1'inde klinik uykusuzluk vardır. Depremden sonra orta ve klinik uykusuzluk riskinin 18-40 yaş grubunda Odds oranı (OR)=2,33 kat, kadınlarda OR=2,07 kat, çocuk sahibi olanlarda OR=1,88 kat ve daha önce uyku bozukluğu olanlarda OR=2,29 kat arttığı bulunmuştur. Olumlu yeniden değerlendirme stratejisinin kullanımı uyku kalitesini artırmış ve alt boyuttaki her bir birimlik artış PSQI puanında 0,137 birimlik düşüşe neden olmuştur. CESS, uykusuzluğu azaltarak hem doğrudan hem de dolaylı olarak uyku kalitesinin iyileşmesine katkıda bulunmuştur.

Sonuç: Depremden sonraki subakut dönemde uyku sorunları yaygındır. Uyku sorunlarına karşı savunmasız gruplar için olumlu yeniden değerlendirme stratejileri geliştirmeye yönelik müdahaleler öneriyoruz.

Anahtar Kelimeler: Uykusuzluk, deprem, uyku kalitesi

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Introduction

Major disasters cause many negative consequences in physical, mental, economic, social and other areas. Various problems may occur in the short, medium and long term in individuals who experience disasters such as earthquakes. One of these problems is the risk of developing insomnia and problems related to sleep quality.[1] After earthquakes, which are one of natural disasters, sleep disorders have been observed at varying rates between 10.7 and 70% among earthquake victims in addition to various psychiatric disorders including post-traumatic stress disorder (PTSD), anxiety and depression.[2-5] Recent studies have shown that impaired sleep is a basic symptom rather than a secondary finding for psychiatric disorders.[6] Findings on the relationship between sleep disorders and psychiatric symptoms have led researchers to investigate sleep disorders that occur after major disasters such as earthquakes.[7] Recognition of sleep disorders will be important in terms of prevention of psychiatric findings and diseases that may develop. The long-term persistence of sleep disorders is an important risk for many cardiovascular and metabolic diseases as well as psychological effects.[8] On 6 February 2023, two consecutive earthquakes with a magnitude of 7.7 Mw and 7.6 Mw occurred in Türkiye with the epicentre in Kahramanmaraş affecting approximately 11 cities. The earthquakes were followed by more than 38 thousand aftershocks with magnitudes up to 6.7 Mw.[9] One of the cities affected by the earthquakes was Adana, where approximately 500 people lost their lives and thousands of buildings were damaged. This study aimed to investigate the frequency of insomnia, the level of sleep quality and the factors affecting insomnia in adults living in Adana at the end of the first month after two major earthquakes.

Materials and Methods

Design and Recruitment

This study was conducted in Adana province by the researchers of Çukurova University Faculty of Medicine, Department of Public Health, Adana, Türkiye in March 2023. The study was conducted in accordance with the Declaration of Helsinki and was approved by Çukurova University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (approval number: 36, date: 07.04.2023). The population of the cross-sectional study consisted of adults living in Adana. The minimum sample size was calculated as 503 assuming a frequency of 20.6%, a type-1 error level of 5%, a confidence interval of 95% and a design effect of 2.[10] The prepared questionnaire form included the written participant consent section where the purpose of the research was mentioned, stating that the information obtained during the research would only be used for scientific purposes, and evaluated in confidentiality within the framework of scientific ethical rules. The questionnaire form was sent to the people on the list from the social media and communication accounts of the researchers and they were asked to distribute it to other people on their own accounts. In order to prevent re-completion, the online questionnaire was allowed to be filled out and submitted once. Among people who were reached by online survey and snowball sampling method and gave consent to participate a total of 587 questionnaires were returned. After removing the questionnaires with missing data or those incorrectly completed 509 questionnaires were evaluated. The questionnaire form included sociodemographic information, questions about the earthquake-sleep relationship, the Insomnia Severity Index (ISI), the Pittsburgh Sleep Quality Index (PSQI), and the Coping Strategies with Earthquake Stress scale (CESS).

Instruments

Insomnia Severity Index (ISI)

The index was developed and tested for validity by Bastien et al.[11] The Turkish validity and reliability study of the scale was conducted by Boysan et al.[12] in 2010. The internal consistency coefficient calculated to determine the reliability of the scale was reported as 0.79. It is a five-point Likert-type scale consisting of seven items. Each item is scored between 0 and 4 and the total score varies between 0-28. The evaluation of the score obtained from the scale is as follows; 0-7 indicates "clinically insignificant insomnia", 8-14 "insomnia subthreshold", 15-21 "moderate clinical insomnia", and 22-28 "severe clinical insomnia".[12]

Pittsburgh Sleep Quality Index (PSQI)

The scale was originally developed and tested for validity by Buysse et al.[13] in 1988. The scale includes a total of 24 questions, among them, 19 are self-rated questions. Five questions are answered by the individual's spouse or roommate, but they are used for clinical information only and therefore not tabulated in the scoring of PSQI. Self-assessment questions include various items related to sleep quality. These are intended to estimate sleep duration and latency, and the frequency and severity of specific sleep-related problems. The 19 items are grouped into seven component scores, each weighted equally on a 0-3 scale. The seven component scores are then summed to yield a global PSQI score which ranges between 0-21; higher scores indicating worse sleep quality. The components are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, sleep medication use, and daytime dysfunction. The sum of these seven component scores gives the total index score. The index does not indicate the presence or prevalence of sleep disorders. However, a PSQI total score of 5 and above indicates poor sleep quality.[13] Ağargün et al.[14] (1996) performed the Turkish validity and reliability study of the PSQI.

Coping with Earthquake Stress Scale (CESS)

The scale was created by Yondem and Eren[15] in 2008 who also performed the scale's Turkish validity and reliability study. The main motivation for the scale was the view that natural disasters were a source of situational stress where there was a threat to life, and that the scales used in the literature to assess coping could not be adapted to all stress situations, and that the functionality of coping strategies might change in different situations. How people cope with natural disasters and traumas was the subject of many studies, where commonly used stress and coping scales were utilised.[16,17] Jeavons et

al.[18] stated that there was an increase in the use of problem-focused coping strategies over time in some studies looking at posttraumatic coping strategies, but there was no change in the use of emotion-focused and especially avoidance strategies. A positive relationship was found between emotion-focused and avoidance strategies. When the literature was examined, it was emphasised that natural disasters had short and long-term psychological effects and that the effects might vary according to the severity, suddenness and unexpectedness of the disaster, and the rate of death and destruction it caused. It could be assumed that after such a disaster, not only the individuals who were primarily affected by the earthquake but also the whole society in general experienced this stress and there were efforts to cope with this situation. CESS was a result of the need to develop a scale to determine coping strategies for earthquake stress, which was a common but not frequently observed source of stress. To determine what these efforts were and through which dimensions they could be explained was important in terms of providing a valid and reliable measurement tool for the researches to be conducted to understand the coping strategies used by the individual towards natural events beyond his/her control and to reveal the different variables related to these coping strategies. The scale consists of three sub-dimensions which are positive reappraisal, seeking social support, and religious coping. The first one positive reappraisal sub-dimension aims to determine if the individual, in response to coping with earthquake stress, tries to build up coping strategies like being optimistic, thinking positively, not magnifying negativities, accepting what was lived as an experience, giving himself/herself time for thinking about the future. The strategies examined in the seeking social support sub-dimension include sharing the experiences, feelings and/or fears with friends or someone who can cope better with the problem. the religious coping sub-dimension includes strategies like entrusting him/herself to God, relaxing in prayer, believing that destiny cannot be changed and fulfilling religious duties more faithfully. In responding to the CESS, a 4-point rating scale was used, ranging from "always (4)" to "never (1)". However, item 4 (I try to keep my emotions to myself) and item 12 (I prefer not to talk about my fears and anxieties) are reversely scored since they express that the individual does not seek social support. The score ranges from 5 to 20 for both the religious coping and seeking social support sub-dimensions, each consisting of 5 items, while between 6 and 24 for the positive reappraisal sub-dimension, consisting of 6 items. The higher the score obtained for each dimension, the more the individual uses that coping strategy, and vice versa. The Cronbach's alpha (α) coefficients for the CESS were found to be α=0.85 for religious coping, α=0.69 for positive reappraisal, and α=0.74 for seeking social support.

Statistical Analysis

SPSS® 20 (IBM, USA) and JAMOVI Ver.2.3 softwares were used in the analysis of the data.[19] The assumption of normality was tested by the Kolmogorov-Smirnov test. Mann-Whitney U test was used for comparisons of two independent groups that did not comply with normal distribution, and Kruskal-Wallis test was used for comparisons of three groups. Spearman correlation analysis was preferred for ratio data that did not meet the normal distribution assumption. In further analysis, multivariate linear regression analysis to estimate the sleep quality score (ratio data that fits normal distribution), logistic regression analysis to estimate the risk of insomnia (dichotomous qualitative data), mediation analysis to evaluate the mediating effect of insomnia on the effect of coping strategies with earthquake stress on sleep quality was used. A $p<0.05$ value was considered statistically significant. Rank biserial correlation coefficient values were calculated in the effect size evaluation. Rank biserial correlation coefficients of 0.10, 0.30 and 0.50 or greater indicated small, medium and large effect sizes, respectively.

Results

The mean age of the individuals included in the study was 29.42±12.62 years (minimum=18 maximum=84) and 73.1% of the participants were female. After the earthquake, 64% of the participants reported decreased sleep duration, 66.8% increased night awakenings, 77.6% difficulty in falling asleep, and 7.3% to start using sleeping pills to sleep. All participants had poor sleep quality, 26.1% had moderate insomnia, and 8.1% had clinical insomnia. Information about the sociodemographic characteristics of the individuals and changes in sleep habits after the earthquake were given in Table 1. When the relationship between the scores obtained from the sub-dimensions of the CSES scale and the sub-dimensions related to insomnia and sleep quality was evaluated, the total CESS score and the CESS Positive reappraisal sub-dimension score were found to show a weak negative correlation with the total ISI score, total PSQI score, and PSQI components sleep latency, and daytime dysfunction, while the CESS positive reappraisal sub-dimension score with PSQI components subjective sleep quality, sleep disorder and sleep medication use (Table 2). The logistic regression model to predict the risk of moderate and clinical insomnia in individuals was found to be significant (omnibus test $p<0.001$). The accuracy rate of the model was 69.4%. The independent variables included in the model were age, sex, employment status, number of children, chronic disease status, psychiatric disease, and sleep disorder. After the earthquake, the risk of moderate and clinical insomnia increased 2.33 times in the 18-40 age group, 2.07 times in women, 1.88 times in those with children, and 2.29 times in those with previous sleep disorders (Table 3). When the scores obtained from the PSQI and ISI scales were compared according to various sociodemographic characteristics, it was found that PSQI scores were higher in females, separated/spouse deceased people, people with chronic disease, people with psychiatric disease, and people with prior sleep problems, while the scores obtained from the ISI were higher in females, separated/spouse deceased people, people with children, actively working people, people with chronic disease, people with prior sleep problems, and people who changed cities after the earthquake (Table 4). The linear regression analysis to predict the PSQI score was found to be significant (analysis of variance $p<0.001$).

The dependent variable was the total PSQI score, while the independent variables of the model were religious coping, positive reappraisal, and social support sub-dimensions of the CESS. The positive reappraisal sub-dimension contributed to the model with each unit increase in this sub-dimension causing a 0.137-unit decrease in the PSQI score (Table 5). In the mediating effect analysis of sleep quality, insomnia severity and coping strategies with earthquake stress; it was found that the direct effect of coping strategies with earthquake stress on sleep quality was not significant, the mediated effect of insomnia was significant and had a negative effect. It caused an indirect increase in sleep quality by reducing insomnia. Coping strategies with earthquake stress had 64.5% of their total effect on sleep quality through indirect effect by reducing the severity of insomnia (Figure 1).

Table 1. Distribution of sociodemographic characteristics and sleep problems

Features	n (%)
Sex	
Female	372 (73.1)
Male	137 (26.9)
Age	
18-40	407 (80.0)
41 and above	102 (20.0)
Marital status	
Married	156 (30.6)
Single	341 (67.0)
Separated/spouse deceased	12 (2.4)
Having children	
No	358 (70.3)
Yes	151 (29.7)
Actively working	
Yes	230 (45.2)
No	279 (54.8)
Sleep duration after the earthquake	
No change	143 (28.1)
Increased	40 (7.9)
Decreased	326 (64.0)
More frequent night awakenings after the earthquake	
Yes	340 (66.8)
No	169 (33.2)
Having trouble falling asleep after the earthquake	
Yes	395 (77.6)
No	114 (22.4)
Starting to use any medication to sleep after the earthquake	
Yes	37 (7.3)
No	472 (92.7)
Insomnia Severity Index	
Clinically insignificant insomnia	137 (26.9)
Lower threshold insomnia	198 (38.9)
Moderately severe clinical insomnia	133 (26.1)
Severe clinical insomnia	41 (8.1)
Pittsburgh Sleep Quality Index	
Normal sleep quality	0
Poor sleep quality	509 (100.0)
Total	509 (100.0)

Discussion

Earthquakes are disasters leading to catastrophic social and economic effects. In addition to physical injuries and deaths, they may lead to behavioural and psychological problems, and sleep problems are among these problems. In this study, sleep problems (sleep quality and insomnia) were investigated in the first month after the earthquake in Adana province, which was affected by two earthquakes with a magnitude of 7.8 Mw and 7.7 Mw, the epicentre of which was Kahramanmaraş in Türkiye on 6 February 2023.[9] According to the results of our study, all of the participants had poor sleep quality (PSQI >5), 26.1% had moderate insomnia and 8.1% had clinical insomnia. After the earthquake, the risk of moderate and clinical insomnia increased 2.33 times in the 18-40 age group, 2.07 times in females, 1.88 times in those having children, and 2.29 times in people with previous sleep disorders. It was found that sleep quality score after the earthquake was higher in females, separated/spouse deceased, people with chronic diseases, people with psychiatric diseases, and people with sleep problems before the earthquake, insomnia was higher in women, divorced/separated people, people with children, working people, people with chronic diseases, people with sleep problems and people who changed cities after the earthquake. In a study conducted by Bavafa et al.[10] after the Ezgeleh earthquake (7.3 Mw) in Iran, the frequency of poor sleep quality was found to be 20.61%. Sleep quality was found to be related to depression, anxiety and severity of stress. Sleep initiation time was found to have a positive relationship with stress. In the study conducted by Khazaie et al.[20] sleep quality and severity of insomnia were found to be associated with some personality characteristics, psychological distress, experiential avoidance and dysfunctional beliefs and attitudes related to sleep. In another study conducted by Khazaie et al.[21] 10 days after the Kermanshah earthquake, it was found that factors such as dysfunctional beliefs and attitudes related to sleep, experiential avoidance, neurotic personality traits and emotion regulation problems associated with poor sleep quality and insomnia were effective. In our study, when coping strategies with earthquake stress were evaluated, a weak negative correlation was found between the positive reappraisal dimension and the total scores of the ISI and PSQI, sleep latency, sleep disturbance, sleep medication use, and daytime dysfunction. It was found that sleep quality was better in individuals with positive reappraisal and each unit increase in the positive reappraisal dimension caused a 0.137-unit decrease in the PSQI score. In the study conducted by Li et al.[22] in Japan, financial difficulties

Table 2. Correlation between insomnia, sleep quality and coping strategies					
		Coping with Earthquake Stress Scale (CESS) scores			
		Total	Religious coping sub-dimension	Positive reappraisal sub-dimension	Seeking social support sub-dimension
ISI total score	r	-0.114**	-0.035	-0.162***	-0.010
PSQI total score	r	-0.094*	0.004	-0.164***	-0.011
Subjective sleep quality (PSQI)	r	-0.057	0.024	-0.131**	0.022
Sleep latency (PSQI)	r	-0.096*	-0.074	-0.131**	0.035
Sleep duration (PSQI)	r	0.040	0.030	0.075	-0.045
Sleep activity (PSQI)	r	0.026	0.016	-0.014	0.030
Sleep disorder (PSQI)	r	-0.066	0.042	-0.160***	-0.008
Sleep medication use (PSQI)	r	-0.059	-0.011	-0.117**	0.015
Daytime dysfunction (PSQI)	r	-0.145***	-0.073	-0.140**	-0.040
*p<0.05, **p<0.01, ***p<0.001.					
ISI: Insomnia Severity Index, PSQI: Pittsburgh Sleep Quality Index					

Table 3. Logistic regression analysis for predicting insomnia risk					
	B	p	OR	95% CI OR	
				Lower	Upper
Age (risk group: 18-40 years)	0.849	0.009*	2.338	1.239	4.411
Sex (risk group: female)	0.727	0.002*	2.070	1.305	3.283
Working (risk group: not working)	-0.304	0.179	0.738	0.474	1.149
Child (risk group: present)	0.635	0.027*	1.888	1.075	3.316
Chronic disease (risk group: present)	0.507	0.082	1.661	0.937	2.943
Psychiatric illness (risk group: present)	0.212	0.553	1.236	0.614	2.488
Sleep disturbance	0.828	0.017*	2.290	1.162	4.512
Constant	-1.521	<0.001	0.219		
*Significant factors; OR: Odds ratio, CI: Confidence interval					

after the earthquake were found to be associated with short sleep duration and insufficient sleep. Two dimensions of social support was measured at baseline: instrumental and emotional support. Instrumental support was assessed by asking the question, "Do you have someone who looks after you when you are sick and confined to a bed for a few days?" Emotional support was assessed by asking if the respondent had someone who listened to his/her concerns and complaints. It was found that instrumental support decreased sleep problems and emotional support increased sleep quality.[22] In our study, no significant relationship was found between social support and insomnia and sleep quality. In the study conducted by Fan et al.[23] the frequency of sleep disorders was reported as 38.3% at 12 months and 37.5% at 24 months after the earthquake. Both at 12 and 24 months, sleep disturbance and short sleep duration were found to be associated with increased depression and PTSD symptoms.[23] In the study conducted by Geng et al.[24] 12 months after the earthquake, it was found that 48.90% of the participants slept less than 7 hours, 27.68% had difficulty falling asleep, 8.82% had problems staying asleep, 22.60% had poor sleep quality, and 40.01% had problems with daytime functioning. Sleep problems assessed by the PSQI general scale remained high until 18 and 30 months after the earthquake, and the prevalence was reported as between 28.79% and 30.18%. It was found that lack of social support, depression, anxiety and unfavourable living conditions increased the risk of sleep problems.[24] In the cohort study conducted by Chen et al.[25] post-earthquake sleep change patterns were examined in people exposed to the Wenchuan earthquake in China and it was investigated whether certain sleep-related change patterns could [predict mental health problems (PTSD), anxiety and depression] 10 years after the Wenchuan earthquake. Four different sleep problem patterns were identified and it was found that individuals with constant-high and increasing sleep patterns were more likely to experience PTSD, anxiety and depression 10 years later.[25] The systematic review conducted by Cox et al.[26] reported that there was a relationship between objective and subjective sleep disturbance and PTSD in studies conducted in different groups and sleep disturbance was found to be a predictor for PTSD. Continued sleep disturbance results in PTSD. It has been reported that sleep disturbance may be more than just an epiphenomenon of PTSD. In the study conducted by Tempesta et al.[27] the effect of earthquake on sleep quality in the long term was investigated. In the comparison of the participants before and after the earthquake, it was found that there was a significant deterioration in sleep

Table 4. Comparison of factors on Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI) scores				
	PSQI scores		ISI scores	
	Median (IQR)	p (effect size)	Median (IQR)	p (effect size)
Sex				
Female	14 (4)*	<0.001 (0.284)	12 (9.25)*	0.024 (0.130)
Male	13 (4)		11 (8)	
Age				
18-40	14 (3)	0.557 (0.037)	12 (9)	0.960 (0.003)
41 and above	13 (4)		12 (8)	
Marital status				
Married	14 (3)	0.021 (0.015)	13 (9)	0.012 (0.017)
Single	14 (3)		11 (10)	
Separated/spouse deceased	16 (2.75)*		14.5 (10.8)*	
Having children				
Yes	14 (3.50)	0.645 (0.025)	13 (10)*	0.020 (0.129)
No	14 (3.75)		12 (9)	
Actively working				
Yes	14 (3)	0.604 (0.026)	13 (8)*	<0.001 (0.180)
No	14 (4)		11 (11)	
Medication use due to a non-sleep-related chronic disease				
Yes	14 (4)*	0.005 (0.189)	14 (8)*	0.002 (0.216)
No	14 (3)		11 (9)	
Mental (psychiatric) illness diagnosed before the earthquake				
Yes	16 (4.5)*	0.001 (0.359)	13 (9)	0.151 (0.132)
No	14 (3)		12 (9)	
Sleep-related illness diagnosed before the earthquake				
Yes	15 (3.75)*	0.002 (0.286)	15 (10.3)*	0.001 (0.297)
No	14 (3)		12 (9)	
Experienced the earthquake in a disaster province and travelled to a province outside the disaster provinces to stay?				
Yes	14 (4)	0.293 (0.059)	12 (9)*	0.025 (0.128)
No	14 (3)		12 (9)	
*Significant values, IQR: Inter-quartile range, PSQI, Pittsburgh Sleep Quality Index, ISI: Insomnia Severity Index Score				

Table 5. Multiple linear regression analysis for the prediction of PSQI score according to CESS sub-dimensions					
CESS sub-dimensions	Unstandardised coefficients		p	Collinearity statistics	
	B	Std. Error		Tolerance	VIF
(Constant)	15.358	0.679	<0.001		
Religious coping (CESS)	0.043	0.031	0.168	0.901	1.110
Positive reappraisal (CESS)	-0.137	0.031	<0.001	0.879	1.138
Seeking social support (CESS)	0.027	0.034	0.423	0.956	1.046
Regression equation (estimated PSQI) = 15.35-0.137 x (positive reappraisal score), PSQI: Pittsburgh Sleep Quality Index, CESS: Coping with Earthquake Stress scale, Std.: Standard, VIF: Variance Inflation Factor					

quality after exposure to trauma. In addition, two years after the earthquake, it was found that PSQI scores were higher in those exposed to the earthquake compared to those living in the surrounding areas, and sleep quality impairment was higher in people living within 70 km from the epicentre of the earthquake. It has been reported that proximity to the epicentre increases the risk of sleep disorders. In the study by Geng et al.[28] approximately 47% of the participants reported difficulty in initiating or maintaining sleep after the earthquake. Sleep disturbances were more common when accompanied by PTSD and depressive symptoms. In longitudinal analyses, depression and PTSD predicted sleep disturbances, while sleep

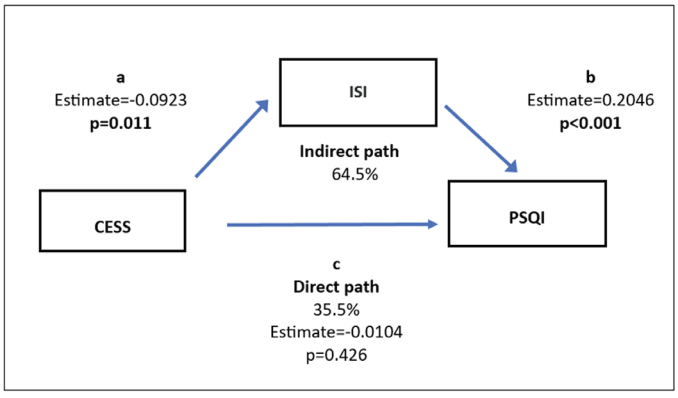

Figure 1. Conceptual diagram of path estimates of mediation between CESS, ISI and PSQI
CESS: Coping with Earthquake Stress Scale; PSQI: Pittsburgh Sleep Quality Index, ISI: Insomnia Severity Index

disturbances predicted depression over time. There was a bidirectional and interdependent relationship between sleep disorders, depression and PTSD.[28] In our study, sleep problems in the subacute period after the earthquake were determined and it was found that the rates of poor sleep quality were higher compared to the literature. This difference in the results may be related to the time when the studies were conducted; in the literature, mostly late-term problems and their results were evaluated. In the study conducted by Ma and Lin[29] media exposure in the post-disaster period was found to be associated with poor sleep quality. Our study was conducted in the subacute period of the earthquake, and the presence of intense media exposure during the study period and the high number of felt aftershocks might have increased sleep problems. The prevalence and incidence of sleep-related problems vary depending on the period of natural disasters and the specific situation. Approximately one-third of the adult population has difficulty sleeping or symptoms of insomnia.[30] The prevalence of insomnia is estimated to be 10% severe enough to cause daytime sleepiness and is higher in women than in men (17.6% and 10.1%, respectively).[31] Additionally, insomnia has been found to be a persistent disorder (lasting more than five years) and affects more than 40% of patients with severe insomnia symptoms at at presentation.[31] In our study, the frequency of moderate and severe insomnia was found to be approximately 35%, and the frequency of poor sleep quality was 100%. Compared to normal times, sleep problems in the general population appear to increase after the earthquake.

Study Limitations

The research was conducted using objective and validated measurement instruments. However, some limitations can be mentioned as the research was single-centred, it was conducted online and the invitations to participate were communicated via social media accounts of the researchers and consecutively of the participants and declaration-based receipt of psychiatric disease information.

Conclusion

Sleep problems were common in the subacute period after the earthquake. Predictors for insomnia and poor sleep quality were being young, being a female, having children, having a sleep disorder before the earthquake, being separated/having a deceased spouse, having a chronic disease, having a psychiatric disease, and changing cities after the earthquake. Detection of sleep problems and intervention in vulnerable groups (women, children, separated people, people with psychiatric illness, and people with chronic illness) in the early period will be important in terms of preventing the emergence of further problems. It was seen that sleep problems that developed after the earthquake were associated with stress in the early period and difficulties in living conditions and psychiatric disorders in the late period. Early detection of sleep problems as both causes and consequences of psychiatric disorders will be very preventive. Longitudinal studies are needed to see the long-term effects of the earthquake on vulnerable groups. We recommend planning interventions that will develop a positive reappraisal strategy in these groups.

Ethics

Ethics Committee Approval: The study was conducted in accordance with the Declaration of Helsinki and was approved by Çukurova University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (approval number: 36, date: 07.04.2023).
Informed Consent: The participants' approval section was included in the prepared questionnaire form.

Footnotes

Authorship Contributions

Concept: B.M., H.D., F.İ.D., K.I., F.T., E.D.M., Design: B.M., H.D., F.İ.D., K.I., F.T., E.D.M., Data Collection or Processing: B.M., F.İ.D., E.D.M., Analysis or Interpretation: B.M., H.D., F.İ.D., K.I., F.T., E.D.M., Literature Search: B.M., H.D., F.İ.D., K.I., F.T., E.D.M., Writing: B.M., H.D., F.İ.D., K.I., F.T., E.D.M.
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