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Research Article

Determination of Post-Earthquake Post-Traumatic Stress Levels of Nurses Who Continue to Work After the Disaster

Berna Bayır[1], Deniz Yavuz Başkıran[2]

[1]Department of Nursing, KTO Karatay University School of Health Sciences, Konya, Türkiye
[2]Liver Transplantation Institute, Inonu University Faculty of Medicine, Malatya, Türkiye

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What is already known on this topic?

- *Disasters such as earthquakes can cause hight levels of psychological stress and post-traumatic stress symptoms, particularly in nurses.*
- *Nurse who continue to work after a disaster are at greater psychological risk due to heavy workloads, lack of resources and constant exposure to traumatic stimuli.*
- *The stress experienced by nurses can affect the quality of care, patient safety and, in tehe long term, their desite to remain in the profession.*

What this study adds on this topic?

- *The research findings provide current and specific data on the mental health of worker after a disaster by quantitatively determining nurses' PTSD levels following an earthquake.*
- *The research has the potantial to contribute to the identification of risk groups by revealing the releationships between nurses' stress levels and demographic characteristics and disaster experiences.*

Abstract

AIM: This study aimed to detect the post-traumatic stress levels of the nurses who continued to work after the earthquake disaster.

METHODS: This research is an cross-sectional study. The research was conducted between March and April 2023.The population of the study consisted of 1200 nurses working in a hospital. About 1200 people were informed about the research. However, 405 nurses agreed to participate in the study. The sample was not selected, and the entire population was reached. Data were collected online with the Post-Earthquake Traumatic Stress Screening Scale 2 months after the earthquakes. The *t*-test, Pearson correlation, and Kruskal–Wallis tests were used to analyze independent groups.

RESULTS: Post-earthquake post-traumatic stress disorder and depression levels of nurses were compared according to their characteristics. In this comparison, it was determined that females had higher mean levels of post-traumatic stress disorder and depression than males, those with less nursing education had higher mean levels of post-traumatic stress disorder and depression than those with higher nursing education, those who lost close relatives in the earthquake had higher mean levels of post-traumatic stress disorder and depression than those who had no loss of life, and those with property/money loss had higher mean levels of post-traumatic stress disorder and depression than those without property/money loss ($p < .05$).

CONCLUSION: It was determined that nurses who continued to provide health services after the two major earthquakes exhibited elevated levels of post-traumatic stress disorder and depressive symptoms.

Keywords: Depression, earthquake, post-traumatic stress, public health, Türkiye

Introduction

Disasters are natural events that cause physical, economic, and social losses that affect the whole society or certain segments of society since the society cannot cope with the events that stop or disrupt life (AFAD, 2014). The events that occur spontaneously in nature such as earthquakes, floods, overturning of rocks, and landslides should cause loss of life and property in society so that they can be named as 'disaster' (Erkal & Degerliyurt, 2011). Earthquakes, which are considered natural disasters, occur in many parts of the world and are estimated to cause 8000 deaths and 26,000 injuries each year (Peleg et al., 2002).

Two large earthquakes with magnitudes of 7.7 and 7.6 occurred in the southeastern parts of Türkiye with the epicenter at Kahramanmaras (Kandilli Observatory, 2023). It is known that these earthquakes caused a considerable number of deaths in 11 provinces; it is believed that they caused many more deaths than the estimates made. People exposed to large earthquakes are known to experience mental health problems such as depression and especially post-traumatic

Corresponding author: Berna Bayır,
E-mail: berna.bayir23@hotmail.com

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stress disorder (PTSD), in addition to many physical health problems (Neria et al., 2008). Post-traumatic stress disorder is a mental health problem caused by life-threatening events that manifest as symptoms of trauma re-experiencing, atrophy, avoidance, and hyperarousal (Radell et al., 2020). This problem can lead to severe illness or early death in the future (Watson, 2019).

Disaster management is necessary to reduce the damage of disasters that may happen to society at any time (Erkal & Degerliyurt, 2011). One of the most needed services is health services in natural disasters and emergencies. Health services needed in disaster situations are "first aid, preventive, curative and rehabilitative health services" (Unsal & Erturk Atabey, 2016). In a previous study assessing the mental health of workers in the disaster area after the Great Japan East Earthquake of March 11, 2011, it was found that the reactions of the public negatively affected the mental health of the workers (Shigemura et al., 2012). In addition, studies conducted after the Japan earthquake noted that many relief workers, including the Japan Self-Defense Force, the Japan Coast Guard, police officers, firefighters, and medical personnel, were required to provide emergency response. It has been reported that such individuals who provide aid and assistance in an emergency are at elevated risk for PTSD (Neria et al., 2008). A systematic review of mental health problems following an earthquake reported that persistent PTSD symptoms can have lasting effects on physical and mental health, including depression and anxiety. It can delay the onset of PTSD, even at subclinical levels. It has been documented that individuals who experience PTSD symptoms at subclinical levels may exhibit enduring effects on their physical and mental health, including the development of depression and anxiety (Matsumoto et al., 2016). A review of recent studies reveals the existence of research examining the mental health issues experienced by the general population in the aftermath of the earthquake (Zhou et al., 2022; Liang et al., 2022; Liang et al., 2021; Matsuyama et al., 2020; Watanabe et al., 2019). However, no study was identified that focused on nurses who experienced an increased workload and stress in the aftermath of the earthquake. It is established that healthcare workers who are also victims of earthquakes experience significantly greater trauma than the general public and are unable to be with their families during this process. The objective of this research was to detect the post-traumatic stress levels of nurses who continue to work after the earthquake disaster, as such issues could cause significant stress disorders in nurses. As no similar study was identified in the literature, it is assumed that this research could significantly contribute to the existing body of knowledge in this field.

Research Questions

1. What are the post-earthquake post-traumatic stress levels of nurses working in the disaster area?
2. What are the sociodemographic characteristics of the nurses working in the disaster area that affect the post-earthquake post-traumatic stress levels?
3. How do differences in family and work environment after the earthquake change the level of post-traumatic stress?

Methods

Study Design

This is cross-sectional research

Sample

It was conducted between March 3 and April 10, 2023.The population of the research consisted of 1200 nurses working in Malatya Turgut Özal Medical Center. It was determined that the sample size to be reached at the minimum level was 292 by calculating the 95% CI from the group whose population size was certain ($n = N$ (t1-a)^2 (p.q) /S^2(N-1)+S^2(p.q)). Since the population is accessible, the sampling method was not used. All nurses were informed about the research. All 1200 nurses were given the chance to participate in the study. However, 450 nurses who met the research criteria accepted to participate in the study. No selection was made by the researchers. The chance to participate was left entirely to the individuals themselves.

All nurses who did not use their leave or sick leave rights after the earthquake and continued to work full-time were included in the study. Since receiving treatment for a psychiatric diagnosis or receiving any psychiatric treatment before the earthquake would affect the results of the study, nurses receiving treatment were excluded from the study.

Data Collection Tools

The Screening Instrument for Traumatic Stress in Earthquake Survivors, which includes demographic variables, was used as a data collection tool.

The Screening Instrument for Traumatic Stress in Earthquake Survivors

The Screening Instrument for Traumatic Stress in Earthquake Survivors was developed by Başoglu et al. (2001) and comprises two sections. The initial section of the scale is the "Survivor Information Form." This section comprises 16 items designed to elicit information regarding the demographic characteristics of the participants, as well as the losses they have incurred as a result of the earthquake and their current mood state. The second section is the "Traumatic Stress Symptom Checklist." In this scale, which was constructed using a 4-point Likert scale to enhance comprehension, the response "does not bother at all" is assigned a value of 0, the response "somewhat" is assigned a value of 1, the response "quite a bit" is assigned a value of 2, and the response "very disturbing" is assigned a value of 3. The section comprises 23 items. The initial 17 items of the scale pertain to PTSD. A score of 25 or above on this section is indicative of a high probability of developing PTSD. The remaining six items pertain to symptoms of depression. It is indicated that individuals who achieve a score of 38 or above on all 23 items are likely to exhibit concomitant depression and PTSD. It should be noted that the scale is used to determine the probable diagnosis, rather than making a complete diagnosis. The Cronbach alpha value of the scale is 0.94 (Başoğlu & Salcioglu, 2011; Basoglu et al., 2001). The Cronbach alpha value obtained from this study was 0.954.

Data Collection

The data were collected via face-to-face interviews. However, the use of paper for the surveys was not preferred. Prior to data collection, a link was created containing the scale items and

the personal information consent letter. This link was shared by the director of nursing services through a social media platform used only by nurses working in the hospital at the time of the interview. The data were collected between April 1 and April 10, 2023, approximately 2 months after the earthquake. The forms of the nurses who consented to participate in the study and met the inclusion criteria were evaluated. The average completion time for each link was 5 to 10 minutes.

Statistical Analysis

The data obtained for statistical analyses were considered statistically significant if the *p*-value was less than .05 through the program IBM SPSS Statistics 24.0 package (IBM SPSS Corp.; Armonk, NY, USA). The conformity of numerical values with the normal distribution was analyzed with the Kolmogorov-Smirnov test in the association of demographic characteristics. Percentages and frequencies were used in the analysis of the research. Independent groups t-test and Pearson correlation were used in parametric cases. Kruskal–Wallis analysis was used in non-parametric cases.

Ethical Considerations

Research approval was obtained from the Ethics Committee for Pharmaceutical and Non-Medical Device Research of KTO Karatay University Faculty of Medicine prior to the start of the research (Approval no: 2023/015; Date: March 31, 2023). Research approval was obtained from the chief physician of the institution where the research was conducted after approval from the ethics committee. The author's consent was obtained for the scale used in the research. All the nurses who were in active working periods were contacted online through the Chief Physician and Nursing Services Directorate of the hospital. The nurses were informed about the research. Verbal and written consent was obtained from those who agreed to participate in the research.

Results

The results of the study were presented by evaluating the statistical analysis results of the data obtained from 405 participating nurses. The mean total PTSD score of the nurses was 37.01 ± 11.51, the mean depression symptom score was 47.42 ± 15.04, and it was found that about 85% of the nurses presented symptoms of PTSD and depression.

A questionnaire was administered to the cohort of nurses to ascertain their demographic characteristics and experiences of the earthquake. The mean age of the participants in the study was determined to be 34.70 ± 7.33 years (minimum age = 22, maximum age = 60). The data revealed that 69.6% of the nurses were women, 67.9% were married, and 56.8% had children. When the characteristics related to the earthquake were examined, 99.8% felt the earthquake tremors, 44.2% were more than 100 km away from the epicenter of the earthquake,

Table 1.
Demographic Characteristics of Nurses and Their Situations Regarding the Earthquake (N = 405)

Variables		Frequency		Variables		Frequency	
		n				*n*	%
Gender	Female	282	69.6	Loss of goods/money	Yes	250	61.7
	Male	123	30.4		No	155	38.3
Marital status	Married	275	67.9	Participation in rescue operations	Yes	93	23.0
	Single	130	32.1		No	312	77.0
Presence of children	Yes	230	56.8	Death of a relative	Yes	67	16.5
	No	175	43.2		No	338	83.5
Felt tremor	Yes	404	99.8	Degree of closeness of the deceased relative	1st degree	3	0.7
	No	1	0.2		2nd degree	33	8.1
Education	High school	11	2.7		3rd degree	29	7.2
	University	371	91.6	Have you been buried under the rubble?	Yes	1	0.2
	Master/PhD	23	5.7		No	404	99.8
Distance to epicenter	50 km	107	26.4	Damage to the house	No damage	11	2.7
	50–100 km	119	29.4		Slightly	212	52.3
	> 100 km	179	44.2		Moderately	62	15.3
Location at the time of the earthquake	At home	368	90.9		Heavily	90	22.2
	On watch	34	8.4		Destroyed	5	1.2
	Open field	3	0.7		Not sure	25	6.2
The place where you live now	In a sturdy house	146	36.0				
	In patient rooms	209	51.6				
	In the tent/In the container	50	12.3				

90.9% were at home during the earthquake, 8.4% were on duty at the hospital, 51.6% used the hospital as a shelter after the earthquake, 61.7% experienced loss of property or money, 23% took part in search and rescue operations, 16.5% had a close relative die in the earthquake, 0.7% of these were first-degree relatives such as mother, sister, or brother, and one nurse was pulled from under the rubble. A survey of the nurses' residences revealed that 52.3% of the homes sustained minor damage, 22.2% experienced severe damage, and 1.2% were completely destroyed (Table 1).

The prevalence of PTSD and depression among nurses in the aftermath of earthquakes was examined in relation to their individual characteristics. The comparison revealed that the mean values for women were 39.08 ± 10.00 and 50.04 ± 13.19, while those for women with less nursing education were 40.27 ± 7.70 and 52.45 ± 9.97. The mean values for those who had a close relative affected by the earthquake were 9.95 and 50.79 ± 12.87, while the highest means were 39.18 ± 10.90 and 50.25 ± 14.27 for those who had experienced property or financial losses, respectively ($p < .05$). The analysis revealed no statistically significant correlation between the mean age of the participants and the prevalence of PTSD and depression ($p > .05$; Table 2).

Discussion

The primary objective of this study was to assess the prevalence of PTSD among nurses residing in regions affected by earthquakes and who continue to aid individuals affected by such disasters. The findings of this study indicate that approximately 85% of nurses exhibited symptoms of PTSD and depression 2 months after the earthquake. In addition, it was determined that the nurses included in the study had higher levels of post-traumatic stress and depression. A study conducted following the 2017 Jiuzhaigou earthquake revealed that participants exhibited elevated levels of depression and anxiety symptoms (Xi et al., 2020). A meta-analysis study investigating the prevalence of PTSD in healthcare workers after the earthquake reported that 16.3% of healthcare workers had PTSD (Tahernejad et al., 2023). A similar ratio was observed in a study conducted on Iranian firefighters (Sahebi et al., 2020), where 23.17% of the participants met the criteria for PTSD. In a study conducted with police officers (Syed et al., 2020), the prevalence of PTSD

Table 2.
Comparison of Nurses' Post-Earthquake Traumatic Stress and Depression Symptom Levels (N = 405)

		The Screening Instrument for Traumatic Stress in Earthquake Survivors					
		PTSD			Depression		
Variables		**$\bar{X}$ ± SD**	***t***	***p***	**$\bar{X}$ ± SD**	***t***	***p***
Gender	Female	39.08 ± 10.00	5.684	**.000**	50.04 ± 13.19	5.504	**.000**
	Male	32.27 ± 13.26			41.40 ± 17.21		
Marital status	Married	37.16 ± 11.13	0.362	.718	47.56 ± 14.47	0.266	.791
	Single	36.70 ± 12.30			47.12 ± 16.24		
Presence of children	Yes	37.55 ± 10.74	1.046	.296	48.10 ± 13.92	1.049	.295
	No	36.32 ± 12.44			46.52 ± 16.40		
Education	High school	40.27 ± 7.70	8.771	**.012**	52.45 ± 9.97	7.924	**.019**
	University	37.29 ± 11.57			47.72 ± 15.12		
	Master/PhD	31.08 ± 10.52			40.21 ± 13.99		
Death of a relative	Yes	39.34 ± 9.95	2.026	**.045**	50.79 ± 12.87	2.012	**.045**
	No	36.55 ± 11.75			46.75 ± 15.37		
Participation in rescue operations	Yes	38.64 ± 11.18	1.584	.115	49.95 ± 14.77	1.875	.063
	No	36.53 ± 11.58			46.66 ± 15.07		
Loss of goods/money	Yes	39.18 ± 10.90	4.942	**.000**	50.25 ± 14.27	4.875	**.000**
	No	33.52 ± 11.65			42.85 ± 15.18		
*Location at the time of the earthquake	At home	37.23 ± 11.35	3.378	.185	47.69 ± 14.91	3.699	.157
	On watch	35.76 ± 13.02			45.85 ± 16.29		
	Open field	25.33 ± 8.50			32.00 ± 10.44		
**Age	*r*	0.069			0.074		
	p	.167			.139		

Independent samples *t*-test.Significant results are written in bold.
Note: $\bar{X}$ = Mean; PTSD = Post-traumatic stress disorder; SD = Standard deviation.
*Since the variable "location at the time of the earthquake" did not show a normal distribution, Kruskal–Wallis analysis was performed.
**Pearson Correlation analysis was used for analysis.

was 14.2%. A study conducted 10 months after the Nepal earthquake revealed that 24.10% of adults had been affected by the seismic event (Adhikari Baral, & Bhagawati, 2019). It is noteworthy that the prevalence of identified problems following previous earthquakes is lower than that observed after the earthquakes in Türkiye. It is thought that the results may be influenced by the timing of data collection and the occurrence of two consecutive major earthquakes within a 9-hour period. In addition, it is thought that the levels of coping with stress may be low in the society where the research was conducted, and this may be due to the fact that administrative initiatives such as social assistance and disaster practices have not been adequately met. PTSD is currently regarded as the most prevalent psychiatric disorder following exposure to traumatic or life-threatening circumstances (Dai et al., 2016). The severity of PTSD is contingent upon the magnitude of exposure (Liang et al., 2019). The prevalence of psychological problems is observed to increase over time (Liberzon & Abelson, 2016). It is postulated that the findings of the study may have been more influenced by the destructive impact of the earthquake.

In this study, it was determined that women showed more symptoms of PTSD and depression than men. Additionally, the relationship between age and PTSD and their levels was not determined. In a study conducted in China, similar to this study, it was observed that PTSD symptoms were higher in women (Liang et al., 2021). Other studies have shown that PTSD is higher in women (Adhikari Baral & Bhagawati, 2019; Hu et al., 2017). The results of the research show similarities with the literature information. Baral and Bhagawati (2019) stated in their study that there is a relationship between age and PTSD (Adhikari Baral, & Bhagawati, 2019). This result differs from the result obtained from the research. It was determined that only 35 of the nurses participating in this study were over the age of 45 (34.70 ± 7.33), and this result suggested that the difference between the studies may be due to the fact that this study was conducted with younger people.

The PTSD and depression levels of nurses who completed their nursing education as high school graduates were found to be higher than the PTSD and depression levels of nurses who graduated from university. It is claimed in the literature that people with higher education levels have better psychological health (Naeem et al., 2011). The result of another study supported this result by reporting that low educational attainment is a risk factor for the development of PTSD after a natural disaster (Ali et al., 2012). Given that the education level under consideration in this study is that of nursing, it seems reasonable to conclude that this outcome affects the capacity to cope with stressors. This, in turn, may indirectly influence psychological symptoms. The fact that the course on stress management is provided in nursing schools in Türkiye during the undergraduate, graduate, and doctoral programs may be a contributing factor to this phenomenon. An elevated level of education enhances an individual's capacity to comprehend traumatic experiences. This may enhance confidence in the improvement of both mental and physical health. It is thus possible to posit that the disorder may be prevented.

It was established that the prevalence of PTSD and depressive symptoms was markedly elevated among nurses who had lost at least one relative either during or following the earthquake, during the grieving process. In a study conducted by Valladares-Garrido et al. (2022), it was found that individuals with a family member injured by the earthquake exhibited a higher prevalence of PTSD symptoms (Valladares-Garrido et al., 2022). The death of family members has been consistently identified as a risk factor for depression in numerous studies in this field (Tang et al., 2014). Additionally, grief has been identified as a risk factor for depression (Divsalar & Dehesh, 2020). Although grief may exacerbate major depression in humans, it is crucial to distinguish between the two for accurate diagnosis and appropriate treatment (Pies, 2014). Moreover, it is hypothesized that the dimension of family member loss may be significantly associated with the emergence of depression. In the context of significant social support being required following the loss of a loved one, the lack of such support may function as a mediator of psychological distress.

Exposure to post-traumatic disasters represents a significant risk factor for the onset of psychiatric symptoms (Cougle et al., 2009; Gao et al., 2023). It was determined that the prevalence of psychological symptoms associated with financial losses was higher in the aftermath of the earthquake. As reported by Wang et al. (2020), trauma exposure is a significant contributing factor to both PTSD and depressive symptoms (Wang et al., 2020). A study conducted with adolescents affected by the 2016 earthquake in Ecuador reported that those who experienced property or financial losses exhibited negative psychiatric characteristics. This outcome has been associated with a deterioration in living conditions (Gerstner et al., 2020). It is hypothesized that the economic crisis experienced in Türkiye prior to the earthquake contributed to the exacerbation of the mental health issues caused by the loss of one's home in the aftermath of the earthquake. Moreover, the unfamiliar assistance provided by nurses from social assistance institutions, the inadequate quality of the aid offered, and the deterioration of living conditions may have contributed to this outcome.

Limitations

Given the persistence of severe aftershocks during the research period, it was evident that stress levels were consistently on the rise. It was not questioned whether the participant had experienced an aftershock immediately prior to the administration of the survey. The earthquake had an impact on eleven cities. Nevertheless, accessibility was impeded by the destruction of numerous medical facilities, which were no longer able to offer their usual services. Therefore, the research was conducted in a hospital in Malatya that has remained operational. A further limitation of this research was the lack of willingness to participate in the study due to the effects of the earthquake.

Conclusion and Recommendations

The findings of this research demonstrated the significant impact of the prevalence and severity of mental disorders experienced by individuals in the aftermath of natural disasters. The earthquake had a profound impact on survivors, with the prevalence of mental health issues, compounded by the challenging circumstances they faced, leading to a significant worsening of these problems. It is possible that this occupational group,

which also provides services as caregivers, may experience significant psychiatric disorders in the following years after the earthquake. It is anticipated that a reduction in the quality of care provided by nurses may be observed in instances where their health and well-being are not adequately safeguarded. It is crucial to reinforce the public health services. It is recommended that government-sponsored hospital administrations implement interventions aimed at addressing post-disaster PTSD in a timely manner, with the objective of improving the mental health conditions of victims. It is imperative that intervention studies be conducted to investigate the effects of social support, support from social services, and psychoeducational programs on mental health in the years following the earthquake.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of University of KTO Karatay (Approval No.: 2023/015; Date: 31.03.2023).

Informed Consent: Written informed consent was obtained from participants who participated in this study.

Peer-review: Externally peer-reviewed.

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