

Earthquake and mental health of healthcare workers: A systematic review

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SUMMARY

This systematic review aims to examine the psychological effects of earthquakes on healthcare workers and the related variables influencing these psychological effects. This study includes 11 research articles that assessed the psychological effects of earthquakes on healthcare workers by categorizing them under various mental health outcomes. Through keyword searches in databases, it was observed that healthcare workers experienced posttraumatic stress disorder, burnout, depression, stress, and decline in quality of life. Factors affecting the mental health of healthcare workers after earthquakes include gender, professional and earthquake-related factors, personality traits, social support, coping strategies, psychological resilience, and meeting personal needs. The review study provides important clues for interventions that could reduce negative mental health effects on healthcare workers following earthquakes.

Key Words: Earthquake, healthcare workers, psychological health, mental health, post-traumatic stress

INTRODUCTION

On 6 February 2023, devastating earthquakes hit Turkey and Syria. According to the Moment magnitude scale, on 6 February 2023, two earthquakes with a magnitude of 7.7 centred in Pazarcık in Kahramanmaraş province and two earthquakes with a magnitude of 7.6 centred in Elbistan occurred. On 20 February 2023, there was another earthquake with a magnitude of 6.4 centred in Samandağ. As a result of these earthquakes, according to official figures, at least 48448 people lost their lives in Turkey and at least 8476 people in Syria; more than 129 thousand people were injured and about 14 million people were affected by the

earthquake. Following these earthquakes, which caused severe damage in 11 provinces, it was noted that nearly 17,000 aftershocks occurred (1,2). Our country, which is located in the earthquake zone, has experienced earthquakes of similar magnitude of 7.8 and 7.5 in Gölcük (Kocaeli) and Düzce in 1999, and 7.9 in Erzincan in 1939, causing many casualties and property damage (3).

Earthquakes are unforeseeable, abrupt and unmanageable natural occurrences. It is deemed a social tragedy that has a considerable impact not only on the inhabitants in the earthquake-stricken area but also the search and rescue teams who travel to the location to provide assistance in different

DOI: 10.5505/kpd.2023.70845

Cite this article as: Sehlikoglu S, Yilmaz Karaman IG, Yastibas Kacar C, Canakci ME. Earthquake and mental health of healthcare workers: A sistematic review. Turkish J Clin Psych 2023; 26:309-318

The arrival date of article: 30.05.2022, **Acceptance date publication:** 19.09.2023

Turkish J Clinical Psychiatry 2023;26:309-318

areas, public officials who volunteer or work officially, and individuals who work for non-governmental organisations (4,5). Following seismic activity such as earthquakes, individuals who are directly exposed to the event and those who receive detailed information about it second-hand, even if they do not witness or experience it themselves, as well as the teams operating in the affected area, may suffer from traumatic stress symptoms that arise after the trauma. These symptoms are classified as secondary traumatic stress or vicarious traumatization and parallel the experiences of primary trauma survivors (6,7). The medical personnel who arrived in the region following the earthquake bore witness to the traumas suffered by locals and encountered several unfavourable conditions. Post-traumatic mental health issues can be observed in healthcare workers who were present during the earthquake, as well as those who arrived to respond. Health workers who offer services to people exposed to trauma have been studied using various concepts that differ from those explored for those who experienced the earthquake. These include compassion fatigue, secondary traumatic stress, indirect trauma, and burnout, as documented in reference 8.

Before a disaster, healthcare professionals who live in the affected area not only serve as rescuers but are also affected by the disaster themselves, unlike those arriving to offer support. Local healthcare workers often face the loss of family and friends and may not have the opportunity to communicate with their loved ones. Following the 2010 Yushu earthquake, a study revealed a higher incidence of post-traumatic stress disorder (PTSD) in local health workers in comparison to those who had travelled to provide support. The cause of this disparity remains unclear (9). Similarly, another study found that therapists exposed to the earthquake suffered increased levels of burnout and lower levels of personal accomplishment compared to non-exposed therapists (10). Zhen et al. (11) revealed that nurses who experienced earthquakes reported considerably elevated levels of PTSD and depression symptoms within one year when compared to unexposed nurses. The results were objective and supported by the study's findings.

In addition to the urgent treatment of serious

injuries during disasters, it has been noted that these events can worsen acute and chronic physical and psychological conditions in individuals, resulting in greater demand for healthcare services (12). Healthcare workers providing emergency medical services in disaster zones may face additional pressures and are at risk of experiencing secondary traumatization due to exposure to graphic images, including corpses, severe injuries, blood, and difficult circumstances (13). Furthermore, healthcare workers have been found to suffer psychological disorders more frequently than the general population in disaster situations (14). Failure to accept the risk of fulfilling one's duty, being apart from one's family, daily needs' inadequacies and experiencing mental exhaustion have adverse effects on mental health (15).

Healthcare professionals frequently work under demanding circumstances and are required to make essential clinical decisions on the ground. In addition to coping with personal losses, financial hardships and housing damages stemming from the disaster, they may also be exposed to a range of issues linked to weakened infrastructure caused by earthquakes, increased risk of endemic disease transmission, extended work hours, staff deficits, physical exhaustion, anxiety, burnout and even chronic unpredictable effects like PTSD (16).

Although post-traumatic stress symptoms do not occur uniformly in all individuals, some may be asymptomatic. Furthermore, other individuals may suffer from various psychological issues, including suicide, anxiety disorders, and substance use disorder, as well as conditions such as short-term adjustment disorder, PTSD, or major depressive disorder, after experiencing trauma (17,18,19,20,21). Risk factors for PTSD are divided into two categories: those related to the traumatic event and those related to the individual exposed to trauma. It is important to note that identifying these risk factors can be helpful in preventing PTSD. The most serious risk factor associated with the event is the trauma's severity, type, and duration (22). Risk factors related to the traumatised individual include being female, having a history of traumatic experiences, coping mechanisms, and the level of depression. Meanwhile, youth, low socioeconomic and educational levels, singleness, widowed or

divorced status, and a personal or family history of psychiatric illness are identified as risk factors for PTSD (23). Living at the centre of a disaster, suffering personal losses, being part of the initial response team, and having limited work experience are all factors that markedly impact the mental well-being of healthcare workers involved in rescue efforts. However, there are several protective factors for PTSD, including having received professional mental health education before, advanced age, male gender, professional experience, and social support from family and friends (9,26,27,28).

Mental health conditions have a detrimental impact on the daily lives of healthcare professionals. Burnout, already prevalent among healthcare workers in their routine work, is even more common in the context of disaster response (30). Research suggests that burnout affects 30% to 70% of healthcare workers (30,31). Studies conducted after the Great East Japan earthquake suggest that burnout, which has a detrimental effect on healthcare workers' work and daily life, could also lead to various mental health issues, notably PTSD (32, 33, 34).

As a result, there are many studies showing that healthcare workers working in various social disasters such as earthquake, nuclear accident, fire, tsunami, COVID-19 are negatively affected mentally (29,32). PTSD, depression, anxiety, and substance abuse are the main mental problems experienced (20). Various factors that increase or reduce the risk of mental health problems among healthcare workers are believed to exist. Identifying and understanding these factors is crucial for improving the mental health practices within this workforce. When examining the relevant literature, it is clear that while there are indeed review studies regarding the effects of diverse social disasters on healthcare workers, these studies can only be linked to one specific psychopathology, such as PTSD (20), and the correlation with different social traumas (35). As such, it has been noted that there is a paucity of review studies that directly concentrate on the mental wellbeing of healthcare professionals working in earthquake-prone areas and aftermath zones. It is crucial to assess the mental wellbeing of healthcare professionals who have a vital role in providing immediate and lasting medi-

cal care in earthquake situations, particularly in our earthquake-prone country. Initial findings indicate that healthcare workers experienced psychosocial challenges following the earthquakes that occurred in Turkey on 6 February 2023 (36).

Therefore, the present review intends to examine the impact of the earthquake on the mental well-being of healthcare professionals and the contributing factors influencing their mental health.

METHODS

The primary aim of the investigation was to assess the impact of the earthquake on the psychological well-being of healthcare professionals.

Search Strategy

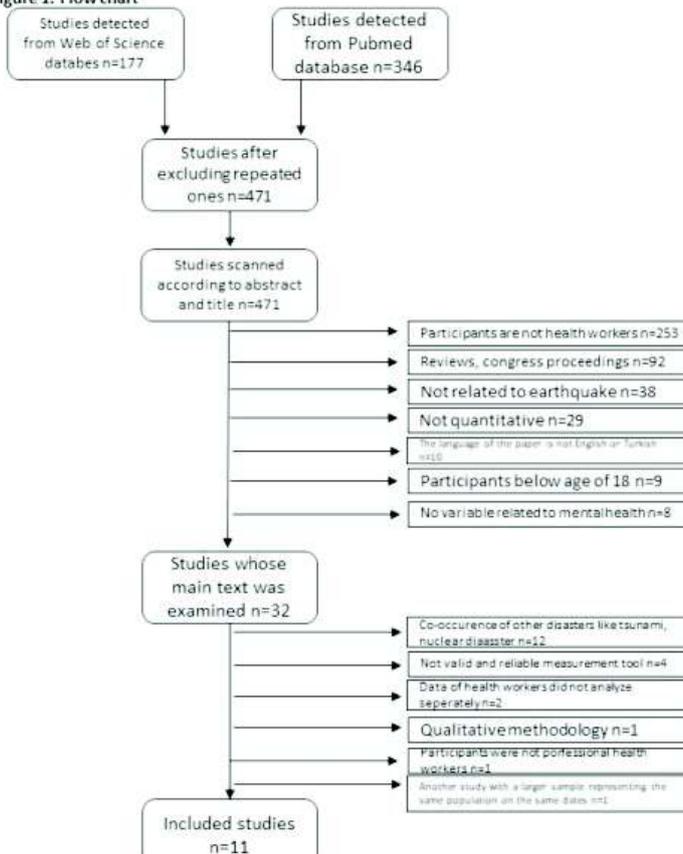
The current review study utilized the Web of Science and PubMed databases. The analysis followed the PRISMA criteria (37) to ensure a systematic approach. To search both databases, keywords such as "healthcare worker," "health personnel," "medical responder," "earthquake," "mental health," and "psychological health" were employed.

Selection of Studies

The systematic review employed inclusion criteria, including that the study: a) had been published from 2003 to present, b) had healthcare professionals as the sample, c) was quantitative in methodology, d) analysed the impact of the earthquake on the mental health of healthcare professionals, and e) was composed in English or Turkish. Exclusion criteria consisted of the following: a) publications prior to 2003, b) studies failing to involve healthcare workers as individual participants or not analyzing data relevant to healthcare workers separately, c) studies devoid of any mental health outcome, d) types of studies other than original research such as case reports, reviews and meta-analyses, e) simultaneous occurrence of another disaster with the earthquake.

A total of 523 studies have been acquired through the specified keywords. The remaining 471 studies

Figure 1. Flow chart



underwent separate screening by two independent researchers following removal of repeated studies. Subsequently, a third researcher scrutinised the selected studies, identifying discrepancies in the decisions made. All identified studies were then deliberated upon by three researchers until a consensus was achieved by mutual agreement. The entire process of study selection is depicted in the PRISMA flowchart (Figure 1).

RESULTS

After applying the inclusion and exclusion criteria, we analysed 11 studies for our systematic review. We summarised our findings in Table 1.

The included studies were published between 2010 and 2022, and the number of participants ranged from 63 to 1527. Two studies were longitudinal, and nine were cross-sectional. The seismic events linked to mental health outcomes in this investigation comprise the 2008 Sichuan-Wenchuan earthquake (4 studies), the 2009 L'Aquila earthquake (2 studies), the 2010 Yushu earthquake, the 2014 Ludian earthquake, the 2015 Nepal Earthquake,

the 2018 Taiwan Hualien earthquake, and the 2020 Malatya-Elazığ earthquake. The data collection processes for the studies encompassed a broad time interval, ranging from 3 weeks to 11 years after the earthquake.

Outcome variables concerning the mental health of healthcare workers following the earthquake were investigated. Seven studies focused on post-traumatic stress, 2 studies investigated burnout, 2 studies looked at the decline in quality of life, 1 study explored psychological stress and 1 study analysed depression. In terms of mental health outcomes following the earthquake, the impact of psychological resilience was investigated in 1 study.

Post Traumatic Stress Disorder

The review predominantly focused on PTSD amongst healthcare workers. The research reported varying rates of PTSD, with prevalence ranging between 3.2% and 30%. Notably, psychosocial and demographic factors were identified as influencing post-traumatic stress levels. Researchers recorded a decrease in PTSD over time following the earthquake (38), and previous experience of an earthquake was found to offer some protection against traumatic stress (28). Furthermore, the study revealed that individuals who suffered from water and food shortages during their earthquake relief efforts (39) and those who provided rescue services in their own community (9) reported higher PTSD scores. The analysis of occupational factors indicated that nurses (9,11) and those who were hospitalized during the initial post-earthquake period (40) had a higher level of posttraumatic stress. Female gender (9, 40, 41), an anxious disposition (28), neurosis (39), and a medical and psychological illness background (38) are factors associated with an increased risk for PTSD. Analysis of psychosocial variables showed that failing to maintain regular communication with friends and family during the rescue mission (39) and being separated from family members following the earthquake (40) were positively correlated with more severe post-traumatic stress symptoms. The study revealed that healthcare workers who employed passive coping strategies, including

Table 1. Analyses on sample, method and findings of the studies included in the review (N=11)

Authors	Characteristics	Sample characteristics and size	Mental health variables analysed: Measurement tools	Results
Cansel & Ucuz, 2022	Cross-sectional 2020 Malatya-Elazig earthquake Data collection 3 weeks after the earthquake	Physicians, nurses, midwives, health officers, emergency medical technicians N=201	Post-traumatic stress: Post Earthquake Trauma Determination Scale Temperament: TEMPS-A Temperament Scale	Thinking that a family member would die in the earthquake and anxious temperament traits were associated with higher levels of post-traumatic stress symptoms. Previous earthquake experience was found to be protective against high trauma reactions. 25.8% of health workers had severe post-traumatic stress symptoms (PTSD)
Guo et al., 2022	Cross-sectional 2008 Wenchuan earthquake Data collection 11 years after the earthquake	Physicians and nurses N=1527	Psychological Resilience: Connor-Davidson Psychological Resilience Scale Post-traumatic growth: Posttraumatic Growth Inventory	After eleven years, exposure to disasters was not significantly associated with resilience. Those working in large hospitals reported higher levels of resilience. Being female, having higher levels of education, being employed longer and having higher posttraumatic growth scores were associated with greater resilience.
Nieh et al., 2020	Longitudinal 2018 Tayvan Haulien earthquake Data collection 1 and 7 months after the earthquake	Physicians, nurses, emergency medical technicians N=63	Post-traumatic stress: Davidson Trauma Scale	After one month, 17.5% of emergency workers met the criteria for PTSD. After seven months, this rate fell to 3.2%. Predictors of PTSD were a history of medical illness and a history of psychiatric illness. Those with PTSD were less willing to serve as health workers in the future in the event of a disaster.
Mattei et al., 2017	Cross-sectional 2009 L Aquila earthquake Data collection 6 years after the earthquake	Physicians, nurses, health care support staff N=284	Burnout: Maslach Burnout Scale Psychological stress: General Health Questionnaire (GHQ-12)	23.4% of health workers had high levels of burnout. Hostile relationships with colleagues, direct exposure to earthquakes, moderate or high levels of stress predicted high levels of burnout.
Schenk et al., 2017	Cross-sectional 2008 Wenchuan earthquake Data collection 14 and 17 months after the earthquake	Medical rescue teams N=337	Post-traumatic stress: Impact of Events Scale - Revised Form Coping: 20-item Simple Coping Style Questionnaire Personality traits: Eysenck Personality Questionnaire-Revised Short Form	Seventeen per cent of the participants had PTSD symptoms above the threshold. Experiencing water and food shortages was associated with PTSD. PTSD symptoms were more severe in those who were injured during rescue missions, those who did not communicate regularly with family and friends during the mission, those who resorted to passive coping, and those with neurotic personality traits.
Kang et al., 2015	Cross-sectional 2010 Yushu earthquake Data collection 8 months after the earthquake	Medical rescue teams N=303	Post-traumatic stress: PTSD Checklist Civilian Version Quality of life: World Health Organisation Quality of Life Scale-Short Form (WHOQoL-BREF)	The overall prevalence of PTSD was 21.8%, 28.6% in local rescue teams and 18.2% in support teams. The prevalence of PTSD was higher among those aged 40-50 years, women, Tibetans, nurses, those who had been in serious danger, those who had witnessed injuries to other rescue team members, those who had witnessed severely damaged houses, and those who had felt guilty about the injury or death of another person. The most important predictor of quality of life was the PTSD score.
Shrestha, 2015	Cross-sectional 2015 Nepal earthquake Data collection 2 months after the earthquake	Physicians, nurses, paramedics, and student volunteers N=64	Post-traumatic stress: Posttraumatic Stress Disorder Checklist for DSM 5 - PCL-5	21.9% of health workers met the criteria for PTSD. PTSD scores were higher among women, those who were hospitalised in the first period after the disaster, those who witnessed death and injury, those who were separated from their families during the earthquake, and those whose working hours were extended. 59% reported a decrease in their ability to function at work and at home. Being female and being a nurse were risk factors for loss of social and occupational functioning.
Tang et al., 2015	Cross-sectional 2014 Ludian earthquake Data collection 1 month after the earthquake	Medical rescue teams N=349	Health-related quality of life: Short Form-12 Quality of Life Scale	Poor mental health was associated with non-military status, younger age, female gender, exposure to hazards in the line of duty, and lower levels of education.
Valenti et al., 2014	Longitudinal 2009 L Aquila earthquake Data collection 1 month before, 1 year after and 2 years after the earthquake	Autism therapists N=64	Burnout: Maslach Burnout Scale	The burnout scores of those exposed to the earthquake at 1 and 2 years were higher than those of autism therapists who did not experience the earthquake.
Zhen et al., 2012	Cross-sectional 2008 Wenchuan earthquake Data collection 1 year after the earthquake	Nurses N=446	Post-traumatic stress: Traumatic Stress Symptom Scale Depression: Traumatic Stress Symptom Scale	According to psychometric tests, PTSD was found in 30% and depression in 27.1% of the participants who had worked in the earthquake zone, while PTSD was found in 10.2% and depression in 9.7% of the nurses who had not been exposed to the disaster. Mental health problems were more common among younger nurses. Earthquake-related anxiety was more common among nurses who had participated in rescue operations for the first time.
Wang et al., 2010	Cross-sectional 2008 Sichuan earthquake Data collection 3 months after the earthquake	Healthcare workers (no details provided) N=343	Post-traumatic stress: Impact of Events Scale - Revised Form	PTSD was found in 19% of health care workers. Being female, being injured, having lost loved ones, and experiencing severe fear during the event were associated with the severity of PTSD.

smoking, alcohol consumption and erratic eating, experienced higher levels of PTSD (39). This is the only study on coping strategies.

Depression

One of the studies included in the review analysed depression and found that the depression rate was 27.1% among nurses who were exposed to an earthquake in their evaluations one year later (11). The same study observed that the most prevalent depressive symptoms experienced by nurses were reluctance and lack of energy. Additionally, 8.6% reported having suicidal thoughts. The study emphasised that working in the earthquake epicentre and experiencing previous disasters were important factors contributing to psychological distress, such as depression (11).

Psychological Distress

As part of the review, a study analysed psychological stress levels using the Patient Health Questionnaire. The research found that 20.4% of healthcare workers experienced pathological psychological stress six years after the earthquake. Interestingly, physicians reported experiencing greater psychological stress than other healthcare workers (31).

Burn-out

Six years after the earthquake, 23.4% of healthcare professionals reported experiencing high levels of burnout (31). It was found that sociodemographic variables like age, gender, and marital status were not associated with burnout. However, direct exposure to the earthquake, the presence of hostile relations with colleagues, and high stress levels were identified as factors related to burnout (31). In a separate investigation, it was found that autism therapists who encountered the earthquake had more significant burnout scores than individuals who did not experience it (10).

Impairments in Life Quality

Two studies in the review focused on healthcare

worker quality of life after the earthquake. The researchers found a serious decline in their quality of life (9). Risk factors for worse quality of life included being young (42), female (9,42), and untrained in medical rescue teams (42). Experiencing danger during the mission and not being military personnel also negatively impacted quality of life (42). In Kang et al.'s (2015) study, the emergence of PTSD was identified as a crucial factor impacting quality of life (9).

Resilience

A study investigated the lasting impacts of earthquakes on healthcare workers, specifically their levels of psychological resilience and posttraumatic growth 11 years after the Wenchuan earthquake. Results indicated that exposure to the earthquake did not have a long-term effect on psychological resilience. However, when controlling for earthquake exposure, sociodemographic factors, and posttraumatic growth scale score, exposure to the earthquake had a significant association with psychological resilience (27). Psychological resilience was found to be greater in female participants, those with a higher level of education, and those with more professional experience. The study also found that posttraumatic development positively influences psychological resilience. Moreover, the research determined that posttraumatic development is not associated with earthquake exposure (27).

DISCUSSION

The purpose of this systematic review was to investigate the impact of the earthquake on the mental well-being of healthcare professionals and to identify the factors that contribute to mental health issues. This review aims to provide insight into the mental health implications of disasters on healthcare workers. The authors reviewed two databases and included 11 research articles meeting the review criteria. Healthcare practitioners who participated in the earthquake response and its subsequent aftermath were found to have suffered from symptoms of post-traumatic stress disorder (PTSD), depression, psychological stress, and burnout, resulting in a decline in their quality of

life. Furthermore, a study investigated the potential protective effects of psychological resilience and post-traumatic growth. The majority of the studies included in this review highlighted the hazards of PTSD in healthcare workers. The present review study categorised the factors influencing mental health into personal and environmental factors and scrutinised their correlation with each mental health condition in detail.

The investigation examined the ties between sociodemographic variables and PTSD, and determined that age was a significant factor affecting the development of PTSD amongst medical rescue teams, with PTSD prevalence escalating as age increased (9). However, studies indicate that age is not a determining factor in the development of PTSD (38,39,40,41). Mental health scores were found to increase in healthcare workers with advancing age (42), with young and middle-aged female nurses being at a higher risk for mental symptoms following disasters (11). It is believed that variations in current physical condition, prior exposure to trauma and psychological training contribute to this trend (9). Valenti et al.'s study excluded gender comparison as the majority of healthcare workers were women (10). Furthermore, research has indicated that the occurrence of PTSD and burnout among healthcare workers does not differ significantly based on their gender (27,31,38).

When examining the correlation between marital status and PTSD, psychological resilience, and burnout in healthcare professionals, research indicates that there is no meaningful difference between married and unmarried workers (28,31,39,41,42). Nevertheless, one investigation revealed that the cognitive sub-score of the post-earthquake trauma scale was greater in married healthcare workers. This outcome is attributed to cognitive impacts such as the concern of losing one's child and feeling of responsibility (28). While some research indicates that employees with a high level of education are less vulnerable to the psychological impact of earthquakes (11,27), other studies suggest that education is not a significant factor for trauma (9,38,41). One study has shown that medical rescue teams with lower education levels have a higher chance of experiencing deterioration in

their mental health (42). Additionally, occupation has been identified as a crucial variable affecting the incidence of PTSD. Nurses often engage in emotional labour when providing medical care, which entails spending extended periods of time with patients. This can result in increased feelings of guilt in the event of any errors. Additionally, it is important to acknowledge the impact of gender, given the majority of nurses are women and the potential negative consequences of gender roles on female healthcare workers' mental health in the post-disaster period (9). Another study revealed that physicians had significantly higher emotional burnout scores than allied health personnel, particularly (31). Guo et al. conducted a study that concludes that nurses possess a higher ability to cope with stress in comparison to doctors (27). There are also studies demonstrating that being a doctor or a nurse does not associate with PTSD (38,40,42). In general, the evaluation of the relationship between sociodemographic variables and mental health drew attention to contradictions in research findings. These results suggest that further research on demographic variables is necessary to assess the impact of earthquakes on the mental health of healthcare workers.

Exposure to earthquakes was found to have no lasting effects on health workers in terms of psychological resilience and post-traumatic development (27). Wang et al. found no significant association between witnessing death and PTSD in healthcare workers (41). A possible reason for this may be the normalisation of death in the professional practice of healthcare workers. However, the same study found that the intensity of the first fear and the severity of PTSD symptoms increased in direct proportion. When the earthquake experience was analysed, it was found that those who experienced serious danger during rescue operations (9,39), those who worked in the first hours of the earthquake had higher levels of PTSD (9,39,40) and those who were on rescue duty for the first time had more anxiety (41). These findings suggest that psychological resilience can be enhanced by qualified psychoeducation received prior to the earthquake, consistent with the views of Kang et al. and that the recruitment of individuals with resilient personalities to rescue work is an important protective factor against trauma (9). Similarly, Cansel and

Ucuz emphasised the importance of the relationship between personality structure and trauma, finding that healthcare workers with depressive, cyclothymic and anxious personalities were exposed to more severe trauma (28). Anxious individuals were found to have exaggerated reactions to distressing events and were unable to adapt (39). In addition to personality, chronic illness and psychiatric illness in the healthcare worker were found to be important predictors of the development of PTSD (38). It was concluded that some personality traits, chronic illness and psychiatric illness are important factors for health care workers to experience traumatic stress.

Another environmental factor that emerged from the research included in the review is the social support and quality of life that health workers received after the earthquake. Cansel and Ucuz found that receiving help and support from family and friends was not related to the level of trauma, and attributed this to the fact that the participants survived the earthquake with little material damage and experienced occupational deformation against traumatic events (28). This may be explained by the low severity of the earthquake and the level of destruction it caused. Another study showed that large hospitals provided more adequate social and resource support than small hospitals, and that workers in large hospitals had higher levels of psychological resilience (27). At the same time, PTSD has been found to impair the social and occupational functioning of workers. According to the studies, the fact that the personal needs of healthcare workers are not met and that they have inadequate resources and psychosocial support increases the stress of individuals after the earthquake and negatively affects their functionality.

Another variable that stands out in studies examining earthquakes and the mental health of health workers is burnout. One study of health workers found that direct exposure to the earthquake was associated with high levels of burnout. At the same time, workers' perceptions of high workload and poor relationships with colleagues were identified as risk factors for the development of burnout (31). It has been highlighted that teamwork, social support and cooperation between colleagues play a protective role against burnout; therefore, the

importance of regular monitoring of health workers and developing preventive strategies is emphasised (10,31). In addition, administrative support has been found to be negatively related to emotional burnout and positively related to personal accomplishment (10). Studies agree that factors such as high workload and inadequate social support contribute to burnout.

Earthquakes have a negative impact on the mental health of health workers, who are one of the first groups to work in the disaster area. To this end, the relevant literature has carried out cross-sectional and longitudinal studies aimed at identifying the mental health problems of health workers and examining the variables associated with mental health. As a result of the studies examined in our review, it has been observed that healthcare workers experience PTSD, depression, psychological distress, burnout, deterioration in quality of life, as well as experiences such as psychological resilience and post-traumatic development. Studies on the effects of variables such as age, marital status and education level on PTSD have varied in the impact of earthquakes on mental health, and in relation to gender, it has been observed that predominantly women experience more PTSD. Although the impact of occupational factors such as being a doctor or nurse on mental health differed, factors such as working hours were found to be important for experiencing burnout. In general, earthquake-related factors such as being exposed to the earthquake, being in the earthquake for the first time, being injured and witnessing severe damage were found to have a negative impact on mental health.

In addition to socio-demographic variables and earthquake-related factors, social support, coping strategies, personality traits, previous chronic illnesses and the presence of psychiatric illnesses were also found to affect the mental health of health workers. Ineffective coping strategies, such as smoking and substance abuse, were found to be a predictor of poor mental health (38). Anxious personality traits and lack of resources and social support lead to poor quality of life and impaired functioning. It has also been observed that the mental health of health workers is significantly affected in earthquakes that cause social trauma. In this direction, it is important that psychosocial

interventions for health workers should aim to improve negative mental health problems such as PTSD and burnout. It is recommended that psychosocial support and rehabilitation programmes be organised to strengthen resources such as social support, effective coping strategies and solidarity.

REFERENCES

1. Kahramanmaraş'ta Meydana Gelen Depremler Hk. – 34. <https://www.afad.gov.tr/kahramanmaraşta-meydana-gelen-depremler-hk-34>. Erişim tarihi: Mayıs 29, 2023.
2. Son Depremler. <http://www.koeri.boun.edu.tr/scripts/1st4.asp>. Erişim tarihi: Mayıs 29, 2023.
3. Büyük Depremler-B.Ü. KRDAE Bölgesel Deprem-Tsunami İzleme ve Değerlendirme Merkezi. <http://www.koeri.boun.edu.tr/sismo/2/deprem-bilgileri/buyuk-depremler/>. Erişim tarihi: Mayıs 29, 2023.
4. Bilal MS, Rana MH, Rahim S, Ali S. Psychological trauma in a relief worker-a case report from earthquake-struck areas of north Pakistan. *Prehospital Disaster Med.* 2007;22(5):458–461.
5. Rucklidge JJ, Afzali MU, Kaplan BJ, Bhattacharya O, Blampied FM, Mulder RT. Massacre, earthquake, flood: Translational science evidence that the use of micronutrients postdisaster reduces the risk of post-traumatic stress in survivors of disasters. *Int Perspect Psychol Res Pract Consult.* 2021;10:39–54.
6. Lerias D, Byrne MK. Vicarious traumatization: symptoms and predictors. *Stress Health J Int Soc Investig Stress.* 2003;19:129–138.
7. Figley CR, Kleber RJ. Beyond the “victim”: Secondary traumatic stress, in: *Beyond trauma: Cultural and societal dynamics*. Edited by: Figley CR, Kleber RJ. New York, NY, Plenum Press; 1995. pp. 75–98.
8. Bell H. Strengths and secondary trauma in family violence work. *Soc Work.* 2003;48(4):513–22.
9. Kang P, Lv Y, Hao L, Tang B, Liu Z, Liu X, Liu Y, Zhang L. Psychological consequences and quality of life among medical rescuers who responded to the 2010 Yushu earthquake: A neglected problem. *Psychiatry Res.* 2015;230(2):517–523.
10. Valenti M, La Malfa G, Tomassini A, Masedu F, Tiberti S, Sorge G. Burnout among therapists working with persons with autism after the 2009 earthquake in LAquila, Italy: a longitudinal comparative study. *J Psychiatr Ment Health Nurs.* 2014;21(3):234–240.
11. Zhen Y, Huang Z quan, Jin J, Deng X yan, Zhang L ping, Wang J guang. Posttraumatic stress disorder of Red Cross nurses in the aftermath of the 2008 Wenchuan China Earthquake. *Arch Psychiatr Nurs.* 2012;26(1):63–70.
12. Health Response to the Earthquake in Haiti-January 2010. <https://reliefweb.int/report/world/health-response-earthquake-haiti-january-2010>. Erişim tarihi: Mayıs 29, 2023.
13. Zhang L, Liu X, Li Y, Liu Y, Liu Z, Lin J, Shen J, Tang X, Zhang Y, Liang W. Emergency medical rescue efforts after a major earthquake: lessons from the 2008 Wenchuan earthquake. *Lancet Lond Engl.* 2012;3;379(9818):853–861.
14. Ren Z, Gao M, Yang M, Qu W. Personal Transformation Process of Mental Health Relief Workers in Sichuan Earthquake. *J Relig Health.* 2018;57(6):2313–2324.
15. Nafar H, Tahmazi Aghdam E, Derakhshani N, Sani'ee N, Sharifian S, Goharinezhad S. A systematic mapping review of factors associated with willingness to work under emergency condition. *Hum Resour Health.* 2021;24;19(1):76.
16. Harrell M, Selvaraj SA, Edgar M. DANGER! Crisis Health Workers at Risk. *Int J Environ Res Public Health.* 2020;17(15):5270.
17. Hollander E, Simeon D. Anxiety disorders in *Essentials of Clinical Psychiatry*. Edited by Hales RE, Yudofsky SG. Washington, DC. American Psychiatric Publishing, Inc, 2004, pp. 339–422.
18. Mao X, Fung WMO, Hu X, Loke Yuen JTA. Psychological impacts of disaster on rescue workers: A review of the literature. *Int J Disaster Risk Reduct.* 2018;1;27:602–617.
19. Nagata K, Tateishi S, Mori K. A literature review of the health effects of workers responding to the Great East Japan Earthquake. *Environ Occup Health Pract.* 2020;2(1):0005RA:1–9.
20. Tahernejad S, Ghaffari S, Ariza-Montes A, Wesemann U, Farahmandnia H, Sahebi A. Post-traumatic stress disorder in medical workers involved in earthquake response: A systematic review and meta-analysis. *Heliyon.* 2023;3;9(1):e12794.
21. Fernandez A, Black J, Jones M, Wilson L, Salvador-Carulla L, Astell-Burt T, Black D. Flooding and Mental Health: A Systematic Mapping Review. *PLOS ONE.* 2015;10(4):e0119929.
22. Sungur M. Secondary Trauma and Social Support. *Türk J Clin Psychiatry.* 1999;2(2):105–108.
23. Aker AT. 1999 Marmara earthquakes: a review of epidemiologic findings and community mental health policies. *Türk Psikiyatri Derg Türk J Psychiatry.* 2006;17(3):204–212.
24. Suzuki Y, Fukasawa M, Obara A, Kim Y. Mental health distress and related factors among prefectural public servants seven months after the great East Japan Earthquake. *J Epidemiol.* 2014;24(4):287–94.
25. Azarmi S, Baniyaghoobi F, Farsi Z, Safshekan S, SHarififar ST. Investigation of the General Health Status of Health Care Workers Involved in Disaster Relief in the Kermanshah Earthquake, in the West of Iran. *Mil Caring Sci J.* 2022;10;9(1):35–44.
26. Er RA, Çakmak H, Öz YC, Aker AT. Kocaeli ili 112 acil yardım birimlerinde çalışan personelin Marmara depreminden etkilenme ve olası afetlere hazırlık durumlarının saptanması. *Akad Acil Tıp Derg.* 2010;9(2):83–88.

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27. Guo C, Li S, Chan SSS. Long-term effects of disaster exposure on health care workers' resilience: A comparison of the Wenchuan earthquake-exposed and unexposed groups. *Int J Disaster Risk Reduct.* 2022;1;67:102658.
28. Cansel N, Ucuz İ. Post-traumatic stress and associated factors among healthcare workers in the early stage following the 2020 Malatya-Elazığ earthquake. *Konuralp Med J.* 2022;14(1):81-91.
29. Sever MS, Ortiz A, Maggiore U, Bac-García E, Vanholder R. Mass Disasters and Burnout in Nephrology Personnel: From Earthquakes and Hurricanes to COVID-19 Pandemic. *Clin J Am Soc Nephrol CJASN.* 2021;8;16(5):829-37.
30. Doolittle BR, Windish DM, Seelig CB. Burnout, Coping, and Spirituality Among Internal Medicine Resident Physicians. *J Grad Med Educ.* 2013;5(2):257-61.
31. Mattei A, Fiasca F, Mazzei M, Necozone S, Bianchini V. Stress and Burnout in Health-Care Workers after the 2009 LAquila Earthquake: A Cross-Sectional Observational Study. *Front Psychiatry.* 2017;12;8:98.
32. Fujitani K, Carroll M, Yanagisawa R, Katz C. Burnout and Psychiatric Distress in Local Caregivers Two Years After the 2011 Great East Japan Earthquake and Fukushima Nuclear Radiation Disaster. *Community Ment Health J.* 2016;52(1):39-45.
33. Kawashima Y, Nishi D, Noguchi H, Usuki M, Yamashita A, Koido Y, Okubo Y, Matsuoka YJ. Post-Traumatic Stress Symptoms and Burnout Among Medical Rescue Workers 4 Years After the Great East Japan Earthquake: A Longitudinal Study. *Disaster Med Public Health Prep.* 2016 Dec;10(6):848-853.
34. Setou N, Fukumori T, Nakao K, Maeda M. Factors related to the fatigue of relief workers in areas affected by the Great East Japan Earthquake: survey results 2.5 years after the disaster. *Biopsychosoc Med.* 2018;12(1):14.
35. Naushad VA, Bierens JJ, Nishan KP, Firjeeth CP, Mohammad OH, Maliyakkal AM, ChaliHadan S, Schreiber MD. A Systematic Review of the Impact of Disaster on the Mental Health of Medical Responders. *Prehospital Disaster Med.* 2019;34(6):632-643.
36. Yılmaz Karaman G, Koçbıyık S, Sarıcı B. Afet Bölgesinde Görev Yapan Hekimlerin Psikososyal İhtiyaçlarının Tespit Edilmesi Çalışması. (cited: 2023 July 15)
37. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA; PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev.* 2015;1;4(1):1.
38. Nieh JH, Hsu TH, Cheng HC, Chong KC, Lai PF. 2018 Taiwan Hualien Earthquake-Disaster Lessons We Learned in the Emergency Department of a Tertiary Hospital. *J Acute Med.* 2020;1;10(4):149-155.
39. Schenk EJ, Yuan J, Martel LD, Shi GQ, Han K, Gao X. Risk factors for long-term post-traumatic stress disorder among medical rescue workers appointed to the 2008 Wenchuan earthquake response in China. *Disasters.* 2017;41(4):788-802.
40. Shrestha R. Post-traumatic Stress Disorder among Medical Personnel after Nepal earthquake, 2015. *J Nepal Health Res Counc.* 2015;13(30):144-148.
41. Wang L, Zhang J, Zhou M, Shi Z, Liu P. Symptoms of post-traumatic stress disorder among health care workers in earthquake-affected areas in southwest China. *Psychol Rep.* 2010;106(2):555-561.
42. Tang B, Ge Y, Liu Z, Liu X, Kang P, Liu Y, Zhang L. Health-related quality of life for medical rescuers one month after Ludian earthquake. *Health Qual Life Outcomes.* 2015 Jun 25;13:88. doi: 10.1186/s12955-015-0286-5. PMID: 26108679; PMCID: PMC4479311.