

The Effectiveness of Acupuncture for the Treatment of PTSD in Patients Witnessing the 2023 Earthquake Disaster in Turkey: A Retrospective Study

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ABSTRACT

Introduction: The February 2023 earthquake in southeastern Turkey resulted in significant loss of life and widespread destruction, leaving many survivors at risk of developing Post-Traumatic Stress Disorder. This retrospective study aimed to evaluate the effectiveness of acupuncture in reducing the symptoms related to Post-Traumatic Stress Disorder among earthquake survivors in Turkey. **Materials and Method:** The medical records of 30 earthquake survivors with diagnosed Post-Traumatic Stress Disorder were retrospectively analyzed. The acupuncture protocol patients received was the Neuro-Psycho-Pathogen Elimination protocol, targeting the amygdala, nucleus raphe, hippocampus, nucleus accumbens, dentate nucleus, hypothalamus, pituitary, and shems points within the Tekci Diagonal Acupuncture System, combined with Traditional Chinese Acupuncture points Yintang, LV3, and GV20. Data were analyzed using descriptive statistics and the Wilcoxon signed-rank test. **Results:** Significant improvements were observed across all measured outcomes. The PTSD Checklist for DSM-5 scores decreased from a mean of 55.6 to 37.0 ($p < 0.001$). The National Stressful Events Survey PTSD Short Scale scores declined from a mean of 3.0 to 1.8 ($p < 0.001$). Additionally, the Pittsburgh Sleep Quality Index scores improved from a mean of 11.9 to 7.4 ($p < 0.001$). **Conclusion:** This study indicates that acupuncture may be an effective treatment for reducing Post-Traumatic Stress Disorder symptoms in earthquake survivors. Further research with larger sample sizes and controlled study designs is necessary to validate these findings and explore the long-term effects of acupuncture on Post-Traumatic Stress Disorder.

Keywords: Acupuncture, Post-Traumatic Stress Disorder, Sleep Quality, Earthquake, Natural Disaster

INTRODUCTION

Natural disasters, such as earthquakes, cause immediate devastation and long-term psychological effects on survivors [1-3]. In February 2023, the southeastern region of Turkey experienced a catastrophic earthquake that led to approximately 50,000 deaths, countless missing persons, and over 100,000 injuries across 11 of the 17 affected provinces. This disaster impacted at least 15 million people and damaged or destroyed 4 million buildings. Among the numerous challenges faced by survivors, the risk of developing post-traumatic stress disorder (PTSD) has emerged as a critical concern [4].

PTSD is a debilitating mental health condition that frequently arises after exposure to traumatic events. It is characterized by symptoms such as re-experiencing the trauma, hyperarousal, sleep disturbances, and avoidance behaviors. Earthquake survivors are particularly vulnerable due to the sudden and unpredictable nature of the disaster, the loss of homes and loved ones, and the prolonged stress associated with rebuilding their lives [1-4]. The high prevalence of PTSD among earthquake survivors underscores the urgent need for effective interventions to alleviate their distress and enhance their overall well-being.

Acupuncture, a complementary treatment method with a long history of use in managing stress-related disorders, shows promise as a therapeutic approach for PTSD. This practice is recognized for its ability to modulate neurobiological mechanisms associated with stress and trauma, making it a valuable therapy for various mental health conditions, including PTSD [5-9].

This retrospective study evaluates the effectiveness of acupuncture in alleviating PTSD symptoms among earthquake survivors in Turkey. Specifically, it examines the NeuroPsychoPathogen Elimination (NPPE) protocol, which targets key brain regions involved in emotional processing, in combination with selected Traditional Chinese Acupuncture points [10]. The NPPE protocol was developed to provide a comprehensive and targeted intervention for trauma-related symptoms.

The significance of this study extends beyond offering a potential treatment option for PTSD among earthquake

survivors. It also contributes to the broader integration of acupuncture into mental health care. The findings have the potential to facilitate the incorporation of acupuncture into mainstream treatment strategies for trauma-related disorders, offering therapeutic benefits to individuals struggling with PTSD symptoms. By investigating the NPPE protocol, this research seeks to advance complementary and alternative therapies for mental health disorders while improving the lives of individuals affected by trauma.

MATERIALS AND METHOD

Study Design

This retrospective study aimed to assess the effectiveness of acupuncture in the treatment of PTSD in individuals who witnessed the 2023 earthquake disaster in Turkey. The study involved a retrospective review of medical records of earthquake survivors who received acupuncture treatment for PTSD.

Participants were included in the study if they met the following criteria: (1) a confirmed diagnosis of earthquake related PTSD, diagnosed by a psychiatrist according to the diagnostic criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition DSM-5, (2) age between 18 and 60 years, (3) completion of three acupuncture sessions, and (4) availability of pre-treatment and post-treatment assessments using standardized instruments.

Acupuncture Protocol

All participants had received acupuncture treatment in the same clinic and the treatment was provided by a physician who is also a certified acupuncturist with 6 years of experience in acupuncture. Each participant underwent three acupuncture sessions, conducted once a week, with each session lasting approximately 45 minutes.

The acupuncture protocol used was the NeuroPsychoPathogen Elimination protocol, which targets specific neuroanatomical regions involved in emotional processing. The NPPE protocol combines the Tekci Diagonal Acupuncture System (TDAS) points [11] with selected Traditional Chinese Medicine (TCM) Acupuncture points to provide a comprehensive and tailored intervention for trauma-related symptoms.



Figure 1. Location of the Tekci Diagonal Acupuncture System points.

The acupuncture points included in the NPPE protocol were:

1. Points of the Tekci Diagonal Acupuncture System (Figure 1)

- Amygdala point
- Nucleus raphe point
- Hippocampus point
- Nucleus accumbens point
- Dentate nucleus point
- Hypothalamus points
- Pituitary points
- Shems

2. Traditional Chinese Medicine Acupuncture points

- Yintang
- Bilateral LV 3
- GV 20

These points were selected based on their functional roles in the brain and their relevance to PTSD pathology:

- **Amygdala Point:** The amygdala is critical for emotional regulation, fear processing, and stress response. In PTSD, hyperactivity in the amygdala is associated with heightened fear and emotional dysregulation. Acupuncture targeting the amygdala point aims to modulate its overactivity, promoting emotional stability and reducing fear responses.
- **Nucleus Raphe Point:** The raphe nuclei are major sources of serotonin in the brain, playing a key role in mood regulation and emotional processing. Dysfunctions in this region in PTSD can lead to anxiety and depressive symptoms. Stimulation of this point may enhance serotonergic activity, alleviating mood disturbances and anxiety.
- **Hippocampus Point:** The hippocampus is involved in memory formation and distinguishing between safe and threatening stimuli. PTSD is often associated with hippocampal atrophy and impaired contextual memory. Acupuncture at this point supports hippocampal function,

aiding in memory processing and reducing intrusive thoughts.

- **Nucleus Accumbens Point:** This region is part of the brain's reward system and is associated with motivation and pleasure. PTSD can disrupt the reward system, contributing to anhedonia and emotional numbing. Targeting this point aims to restore balance in the reward pathways, improving motivation and emotional engagement.
- **Dentate Nucleus Point:** Located in the cerebellum, the dentate nucleus contributes to cognitive and emotional integration. Dysregulation in this area can exacerbate emotional instability in PTSD. Acupuncture stimulation here seeks to harmonize cognitive and emotional responses.
- **Hypothalamus Points:** The hypothalamus regulates the hypothalamic-pituitary-adrenal (HPA) axis, which is often dysregulated in PTSD, leading to chronic stress responses. Acupuncture at hypothalamic points helps normalize HPA axis activity, reducing stress and promoting physiological balance.
- **Pituitary Points:** The pituitary gland, under hypothalamic control, is a central regulator of hormonal responses to stress. Dysfunction in this system can perpetuate PTSD symptoms. Targeting pituitary points aims to restore hormonal equilibrium and mitigate stress responses.
- **Shems Point:** This point is located on the forehead, directly on the anterior midline, 1 cun below the hairline. It is designed to address emotional and neurological imbalances. It complements other points by enhancing the overall therapeutic effect on emotional processing.
- **Yintang:** This traditional acupuncture point is known for its calming and anxiety-reducing effects. It is particularly effective in alleviating stress and improving focus, which are often impaired in PTSD.
- **LV 3:** This traditional acupuncture point is associated with stress relief and emotional regulation.
- **GV 20:** This traditional acupuncture point is used to enhance mental clarity and reduce tension. These points collectively support emotional well-being and resilience.

Data Collection

Medical records of the target patient population, determined according to the above inclusion criteria, were retrieved, and the following variables were extracted:

Standardized instruments assessing PTSD-related symptoms, measured before and after the acupuncture treatment.

1. Baseline characteristics: age, gender, and education level.
 2. Standardized instruments assessing PTSD-related symptoms, measured before and after three sessions of acupuncture treatment:
- **PTSD Checklist for DSM-5 (PCL-5):** Evaluates the severity of PTSD symptoms based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria [12,13].
 - **National Stressful Events Survey PTSD Short Scale (NSESSS):** Assesses the presence and severity of PTSD symptoms in response to specific traumatic events [14].
 - **Pittsburgh Sleep Quality Index (PSQI):** Measures sleep quality and disturbances related to PTSD symptoms [15,16].
 - **Self-reported anxiety and stress levels:** Measured on a Visual Analog Scale (VAS) ranging from 0 to 10.

Statistical Analysis

Statistical analysis was performed using SPSS Statistics 24. Descriptive statistics summarized the demographic characteristics of participants. Changes in outcome measures before and after acupuncture treatment were analyzed using the Wilcoxon signed-rank test. Statistical significance was set at $p < 0.05$.

Ethical Approval

The study design was approved by the Ethics Committee of the Ankara Gulhane Education and Research Hospital of Saglik Bilimleri University (No. 2024/20). The study adhered to ethical guidelines and principles outlined in the Declaration of Helsinki. All participants provided written informed consent for acupuncture treatment and data analysis.

RESULTS

Demographic Characteristics

Medical records of 30 earthquake survivors who met the inclusion criteria were reviewed, and their data were analyzed. The participants had a mean age of 42.2 years, with 23.3% identified as male and 76.6% as female.

Changes in PTSD Symptoms

The effectiveness of acupuncture in alleviating PTSD symptoms was evaluated using standardized measures, including the PTSD Checklist for DSM-5, the National Stressful Events Survey PTSD Short Scale, the Pittsburgh Sleep Quality Index, and patient-reported anxiety and stress scores recorded on VAS.

As shown in Table 1, the pre-treatment mean score on the PTSD Checklist for DSM-5 was 55.6, indicating a high level of PTSD symptoms among participants. Following three

acupuncture sessions, the mean score decreased significantly to 37.0 (**p < 0.001**), demonstrating a substantial reduction in symptom severity.

Similarly, the NSESSS scores exhibited a significant decrease, with the pre-treatment mean score of 3.0 dropping to 1.8 post-treatment (**p < 0.001**). These results indicate a notable improvement in PTSD symptoms after acupuncture therapy.

The PSQI scores also showed significant improvements in sleep quality. The pre-treatment mean PSQI score was 11.9, indicative of poor sleep quality. Post-treatment, the mean score reduced to 7.4 (**p < 0.001**), reflecting a considerable enhancement in sleep quality.

In addition, patient-reported anxiety and stress levels decreased significantly. The mean anxiety score fell from 7.8 to 5.2, and the mean stress score dropped from 8.5 to 6.0 after the intervention (**p < 0.001** for both measures).

Table 1. Comparison of pretreatment and post treatment measurements (statistical analysis Wilcoxon signed-rank test)

	Mean (SD)	Median (25 th -75 th quartiles)	Statistical analysis z; p
DSM5			
Pre-treatment	55.6 (12.6)	54.0 (47.0-65.0)	4.783; 0.000
Post-treatment	37.0 (9.6)	38.0 (31.0-41.0)	
NSESSS			
Pre-treatment	3.0 (0.7)	3.0 (2.0-3.0)	4.650; 0.000
Post-treatment	1.8 (0.7)	2.0 (1.0-2.0)	
PSQI			
Pre-treatment	11.9 (4.2)	12.0 (9.0-15.0)	4.640; 0.000
Post-treatment	7.4 (3.2)	7.2 (5.0-10.0)	
Anxiety - VAS			
Pre-treatment	7.8 (1.3)	8.0 (7.0-8.0)	4.486; 0.000
Post-treatment	5.2 (1.3)	5.0 (4.0-6.0)	
Stress- VAS			
Pre-treatment	8.5 (1.3)	8.5 (8.0-10.0)	4.741; 0.000
Post-treatment	6.0 (1.6)	6.0 (5.0-7.0)	

DISCUSSION

Natural disasters, such as earthquakes, not only result in immediate loss of life and infrastructure but also leave survivors with enduring psychological impacts [1-3]. The southeastern region of Turkey experienced a devastating earthquake in February 2023, which caused approximately 50,000 deaths, numerous injuries, and extensive structural damage across 11 provinces. The disaster affected at least 15 million people and 4 million buildings. The risk of developing PTSD has become a major concern among the challenges encountered by survivors [4].

PTSD is a debilitating mental health condition characterized by symptoms such as re-experiencing trauma, hyperarousal, sleep disturbances, and avoidance behaviors. Earthquake survivors are particularly vulnerable due to the sudden and unpredictable nature of such disasters, the loss of homes and loved ones, and the prolonged stress of rebuilding their lives. The high prevalence of PTSD among survivors underscores the urgent need for effective interventions to alleviate their suffering and improve their overall well-being [1-4]. Acupuncture has emerged as a promising complementary therapy for PTSD, with a history of successful applications in managing stress-related disorders. Its potential to modulate neurobiological mechanisms associated with stress and trauma has attracted attention as an alternative or adjunct to conventional therapies [5-9].

Studies such as those by Moiraghi et al., Wang et al., and Zhang et al. have consistently demonstrated the potential of acupuncture to alleviate PTSD symptoms [5-7]. Moiraghi et al. reported significant improvements in pain and psychological symptoms after three acupuncture sessions [5]. Wang et al. found that electroacupuncture was more effective than paroxetine in reducing PTSD symptoms [6]. Zhang et al. highlighted the enhanced efficacy of combining acupoint stimulation with cognitive-behavioral therapy compared to cognitive-behavioral therapy alone [7].

Additionally, studies by Kim et al. and Hollifield et al. have shown acupuncture's potential to improve psychological well-being and provide sustained symptom relief [8-9]. Kim et al. demonstrated significant reductions in PTSD symptom scores and improvements in sleep quality following ear acupuncture among earthquake evacuees [8]. Similarly, Hollifield et al.'s pilot trial suggested that acupuncture could provide benefits

comparable to group cognitive-behavioral therapy, with enduring effects observed at a three-month follow-up [9].

Animal studies have also provided valuable insights into the mechanisms underlying acupuncture's therapeutic effects. Research by Oh et al. and Jiang et al. suggests that acupuncture modulates the inflammatory response and enhances synaptic plasticity in the hippocampus, key areas implicated in PTSD [17,18]. Similarly, Lee et al. demonstrated the role of acupuncture in reducing neuroinflammation and promoting the expression of brain-derived neurotrophic factors, which are critical for cognitive function and emotional regulation [19]. Lu et al. further explored the anxiolytic effects of acupuncture, highlighting its modulation of orexinergic neurons in the lateral hypothalamus [20].

Our retrospective study contributes to this growing body of evidence by focusing on the effectiveness of the Neuro-Psycho-Pathogen Elimination protocol in treating PTSD among survivors of the 2023 Turkey earthquake. The findings revealed a significant reduction in PTSD symptoms, as measured by the PTSD Checklist for DSM-5 and the National Stressful Events Survey PTSD Short Scale, following acupuncture treatment. Furthermore, participants experienced notable improvements in sleep quality, as evidenced by reductions in Pittsburgh Sleep Quality Index scores.

These findings have important clinical implications. Acupuncture, particularly the NPPE protocol, may serve as an effective adjunctive therapy for PTSD, especially for individuals seeking non-pharmacological treatment options. Its low side-effect profile enhances its appeal as a complementary intervention within multimodal treatment approaches, including psychotherapy.

However, this study has limitations. The retrospective design inherently limits causal inference, and the absence of a control group makes it difficult to attribute improvements solely to acupuncture. Future research should employ randomized controlled trials with larger sample sizes and rigorous controls, such as sham acupuncture or comparisons with standard treatments. Additionally, the long-term effects of acupuncture on PTSD require further exploration. While this study focused on short-term outcomes, longitudinal studies are needed to assess the durability of treatment effects and the potential for relapse.

CONCLUSION

The 2023 earthquake disaster in Turkey caused survivors to endure not only immediate devastation but also long-term psychological challenges, including Post-Traumatic Stress Disorder. In this context, our retrospective study examined the potential effectiveness of acupuncture, specifically the Neuro-Psycho-Pathogen Elimination protocol, as a treatment for PTSD in earthquake survivors.

The findings of this study suggest that acupuncture may offer a valuable therapeutic option for individuals suffering from the complex and debilitating symptoms of PTSD. Significant reductions in PTSD symptom severity, as measured by the PTSD Checklist for DSM-5 and the National Stressful Events Survey PTSD Short Scale, underscore acupuncture's potential to alleviate psychological distress in survivors.

Additionally, notable improvements in sleep quality, assessed using the Pittsburgh Sleep Quality Index, highlight acupuncture's capacity to address the multifaceted nature of trauma-related disorders. By mitigating sleep disturbances - a common and distressing feature of PTSD - acupuncture may contribute to improved overall well-being and quality of life for survivors.

Despite these encouraging results, the study's limitations must be acknowledged. The retrospective design and absence of a control group necessitate caution when interpreting the findings. Future research should emphasize randomized controlled trials with larger sample sizes, extended follow-up periods, and robust control measures to generate more conclusive evidence of acupuncture's effectiveness.

Looking ahead, continued investigation into acupuncture's role in mental health care, particularly following natural disasters, is imperative. Advancing this research may provide a pathway to recovery and resilience for individuals seeking solace and healing in the wake of catastrophic events.

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CONFLICT OF INTEREST

All authors have no conflict of interest.

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